

GSMO TASK ORDER

Task No: **64**
 Modification: **7**
 Task Name: **ATLAS Instrument Trending and Plotting System (ITPS) For I&T**
 Task Period of Performance: **1/28/2013 to 9/30/2015**
 Modification Period of Performance: **3/1/2015 to 9/30/2015**
 GSMO SOW Reference: **2.3.2.4**

I. Task Order History

Description of current modification (Modification 7): This task order modification provides additional scope via new Subtask #2 for upgrades on the ITPS supporting the ICESat-2 MOC. Also, the format of the task order is updated per the prescribed GSMO task order template.

Mod #	Start	End	Brief Description
0	01/28/2013	12/31/2013	Initial task order statement of work
1	7/2/2013		Change of Project RA
2	8/1/2013		Change of Task Monitor
3	1/1/2014	9/30/2014	Extension for start of I&T
4	3/1/2014	9/30/2014	Change of Scope – 2 nd ITPS unit
5	3/24/2014	9/30/2014	Unit #2 specification update
6	10/1/2014	9/30/2015	Extension for sustaining engineering
7	3/1/2015	9/30/2015	Additional scope for the MOC ITPS

II. Background

This task has been for development, delivery, and maintenance of the Instrument Trending and Plotting System (ITPS) units for the ATLAS Integration and Test (I&T) program. Because we are now in the sustaining engineering period, the concept diagrams, additional background, and development specifications have been removed from this document. See the prior mod SOWs for this information, if needed.

The ITPS is a trending system used by ATLAS I&T as well as the ICESat-2 Mission Operations Center (MOC). There are the two I&T units developed and maintained via this task since its start, and there is one MOC unit for which this task modification is adding work. The work shall be performed and tracked via the following subtask arrangement:

Subtask 1: Includes work done to date and ongoing sustaining engineering related to the ATLAS I&T ITPS units.

Subtask 2: New work via this mod, includes delivery of version and capability updates for the ITPS in the ICESat-2 MOC.

III. Scope of Work

The contractor shall develop, deliver, and maintain an Instrument Trending and Plotting System (ITPS) and platform capable of trending and plotting instrument data generated during I&T operations, and mission data generated during mission operations. There are two units for ATLAS I&T and one unit for the ICESat-2 MOC.

A. Requirements

A.1 (Subtask 1): The contractor shall continue to provide support and maintenance for the ATLAS I&T ITPS units as needed throughout the project at GSFC, OSC, and VAFB. This support ends at launch.

The technical point-of-contact for Subtask 2 is Kimathi Tull, the ATLAS I&T Manager, at 301-286-7273, kimathi.n.tull@nasa.gov.

A.2 (Subtask 2): This is the new work for this modification. The contractor shall deliver the enhancements made to the ATLAS I&T version of ITPS to the MOC contractor for use in the ground system for ICESat-2. This work shall include the following:

- Update the ICESat-2 MOC ITPS to accept, without modification, DBX files compatible with the ATLAS ITPS systems, including (but not limited to):
 - Expression conversions (using existing ITPS XPR nodes capability);
- Standardize with ATLAS I&T and ICESat-2 MOC on definition and use of the differing available floating point data type definitions (data type "F");
- Support an epoch of Jan 6, 1980 (with appropriate leap-seconds offset);
- Maintain interoperability of the ICESat-2 MOC ITPS with the ATLAS I&T ITPS units up through delivery of ATLAS to Observatory level I&T;
- Support technical discussions with the Goddard team responsible for ATLAS development, in a working group format;
- As necessary, update the ICESat-2 MOC ITPS to allow Selection (SEL) records, used for sub-commutation.
- Perform a normal acceptance test checkout of the MOC ITPS prior to delivery to demonstrate the ability to ingest specific data types used on ICESat-2.

The contractor should assume the following:

- The ATLAS instrument database and the Orbital Spacecraft database do not have any common mnemonics or packet IDs between the DB definitions (i.e. no overlap);
- The superset of all data types currently used by ATLAS I&T and the ICESat-2 MOC are needed for all ITPS units;

The technical point-of-contact for Subtask 2 is James Busch, the ICESat-2 Ground Systems Manager, at 301-286-6393, james.e.busch@nasa.gov.

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS(s) to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

There are no Government furnished facilities, equipment, or software associated with this Task Order.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

There is no specific travel requirements anticipated during the current task period of performance.

VII. Deliverables

Implementation of upgrades for the ICESat-2 MOC ITPS – by June 15, 2015.

It is anticipated that another drop of MOC ITPS updates will be required in 2016, but this will be a future task order mod.

GSMO TASK ORDER

Task No: #65
Modification: 3
Task Name: GOES-R Program Office
Task Period of Performance: March 5, 2013 to February 29, 2016
Modification Period of Performance: March 1, 2015 to February 29, 2016
GSMO SOW Reference: 2.1, 2.2

I. Task Order History

Description of current modification (Modification 3): Continuation of task order SOW for GOES-R Program Office

Mod #	Start	End	Brief Description
0	3/5/13	9/30/2014	Initial task order statement of work.
1	3/1/2014	2/28/2015	Extension of task order statement of work for second year
2		2/28/2015	Add ISSO certification criteria
3	3/1/2015	2/29/2016	Extension of task order statement of work for third year

II. Background

The Geostationary Operational Environmental Satellite-R Series (GOES-R) is the next generation of geostationary weather satellites, scheduled to launch in 2015. The program is a collaborative development and acquisition effort between the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). The GOES-R satellite will provide continuous imagery and atmospheric measurements of Earth's Western Hemisphere and space weather monitoring. It will be the primary tool for the detection and tracking of hurricanes and severe weather and provide new and improved applications and products for fulfilling NOAA's goals of Water and Weather, Climate, Commerce, and Ecosystem.

The GOES-R Program is managed by NOAA with an integrated NOAA-NASA program office organization, staffed with personnel from NOAA and NASA and co-located at NASA's Goddard Space Flight Center (GSFC). GOES-R is composed of the GOES-R Program Office and two integrated NOAA-NASA project offices: the Flight Project and the Ground Segment Project. The Flight Project oversees the development of the Space Segment, which consists of the spacecraft, the instruments, launch vehicle, and the auxiliary communication payloads. The Ground Segment Project consists of the entire ground system, including the facilities, antenna sites, software and hardware for satellite command and control and to process, create, and distribute end user products, and the Remote Backup facility (RBU).

III. Scope of Work

The Contractor shall provide Technical and Program Support in the form of identification and resolution of issues as well as preparation of plans, briefings, and documents in the areas of program planning and scheduling, technical services, program advocacy, and capital asset planning and data management services for NOAA/NESDIS Geostationary Operational Environmental Satellite (GOES) R-Series (GOES-R) Program.

A. Requirements

- A.1. Engineering Support - The contractor shall provide satellite ground system engineering support to the GOES-R Program and GOES-R Ground Segment (GS) Project on technical management, schedule, architecture assessment, requirements, verification, and validation of the full GOES-R Ground Segment, including Antenna System, and all GS interfaces. Provide support for interface meetings between the spacecraft, ground segment and instrument contractors to reduce implementation risk and ensure verification of all system interfaces. Provide technical assistance to risk reduction efforts, including enterprise and communications studies. Provide general and systems engineering, including corporate ad hoc "reach-back" capability for special topics as requested. Provide impact analysis for Program, Project, and contractor-derived requirements change requests, deviations, and waivers.
- A.2. Integration and Test - The contractor shall provide technical support for the management, analysis, design, integration and testing, deployment, operations, and maintenance of Ground Segment hardware and software. Provide evaluation capability for software quality assurance; support code reviews; conduct software development and process assessments of the development efforts. Develop software as requested to support calibration/validation and product assessment needs. Provide oversight of GS verification and validation efforts, including test engineering support in defining the GOES-R Test and Evaluation Master Plan and other Project V&V documents. Provide technical support for the definition, execution, and evaluation of validation testing, simulations, rehearsals, and post-launch tests.
- A.3. IT Security - The contractor shall provide technical support to the design, implementation, and evaluation of all phases of mission security and information assurance solutions for GOES-R. Provide planning and implementation of NIST FIPS and NOAA IT security policies and requirements. Support planning and execution of Assessment and Authorization work, including activities to achieve and maintain Authority to Operate. Information System Security Officer (ISSO) services shall only be provided by persons who possess and maintain a Department of Commerce-required professional certification, such as Certified Information System Security Professional (CISSP).
- A.4. Transition to Operations - The contractor shall provide technical support for the planning and transition to operations, including training, documentation, and process development. Support the development and implementation of data and mission operations products. Prepare artifacts and materials to support multiple system readiness reviews leading to launch and post-launch acceptance reviews. Work with Flight Project, GS Project, Program, government technical support teams, and development contractor teams to ensure that end user needs are met by the GOES-R system. Provide technical support to the design, implementation, and evaluation of all phases of mission solutions for GOES-R.
- A.5. Technical Communications - The contractor shall provide technical communications support, including meeting facilitation, management briefing development, process improvement, status reporting, and other activities identified by Project or Program management.

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The government shall provide office space at GSFC, necessary office space, desktop computers, telephones, and associated infrastructure, as needed, for individuals if the contractor is working on a Government site. The contractor shall be given access to all information, data, documents, and files that are necessary for the contractor to perform the task.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

The contractor shall travel as needed by the Government for the provision of the above support and services, to the Ground Segment sites, GOES-R development contractor locations, and other locations specified for the work.

At minimum, the contractor shall plan for the representative trips listed below in support of GOES-R during the performance period. Additional travel may be required.

Travel Description	Approximate Time Frame
Miscellaneous Technical Interchange Meetings (TIMs) -- Local Travel	
Local travel – GSFC to NSOF/Suitland, MD	weekly
3 trips / 5 days, Wallops, VA	quarterly
3 trips / 7 days, Fairmont, WV	quarterly

VII. Deliverables

Because of the intermittent nature of these tasks, most specific delivery instructions are often determined on a case-by-case basis, or as specified above. All deliverables shall be presented to the Task ATR and the relevant GOES-R Program technical coordinator in an agreed upon electronic format. The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Update documentation relevant to the GOES-R Program. Documents will be updated in draft form as required for GOES-R management and review, editing, and approval.	As directed

ID	Deliverable Description	Due Date
2	As directed, prepare technical and programmatic materials for Program formal reviews and for Technical Interchange Meetings with designated officials and other GOES-R contractors, and report programmatic and technical issues to the GOES-R management.	As directed
3	As directed by technical lead, prepare technical and programmatic assessments of developer deliverables, plans, and proposals. .	As directed
4	Provide input to the development of specifications, funding profiles, and schedule alternatives.	As directed
5	As directed by technical lead, prepare decision papers to document the alternatives, analyses, and conclusions associated with key decision points.	As directed
6	Prepare and submit monthly updates to the Risk Management Database..	Monthly
7	Draft and final briefing packages to support monthly status briefings, milestone reviews, Technical Interchange Meetings, and other events.	As directed
8	Submit monthly progress reports.	TBD

End of Task Order Statement of Work

GSMO TASK ORDER mod 4

Task No: 66
Modification: 4
Task Name: DSCOVER Pre-Launch and Launch Site Operations Support
Task Period of Performance: 02/18/2013 to 02/28/2015
Modification Period of Performance: 02/01/2015 to 02/28/2015
GSMO SOW Reference: 3.1, 3.2

Task Order History

Description of current modification (Modification 4): This is modification 4 to task order statement of work for DSCOVER Pre-Launch and Launch Site Operations Support.

Mod #	Start	End	Brief Description
0	2/18/2013	1/31/2014	Initial task order statement of work
1	9/17/2013		Admin mod
2	2/1/2014	1/31/2015	Completion date modified for initial task order statement of work.
3	7/15/2014		Admin mod
4	2/1/2015	2/28/2015	One-month task extension

Purpose/Background

This statement of work outlines the contractor support required for pre-launch, launch site and launch operations for the Deep Space Climate Observatory (DSCOVER). The DSCOVER mission – a partnership between the National Oceanic and Atmospheric Administration (NOAA), NASA and the USAF will continue solar wind measurements in support of space weather requirements providing 3-dimensional distribution function of the proton and alpha components of the solar wind; 3-dimensional magnetic field vector and 3-dimensional electron velocity distribution. Secondary objective is to observe the Earth from the unique Earth-Sun L1 perspective. Tertiary objective is to measure the energetic particle environment.

Upon completion of testing at the Goddard Space Flight Center (GSFC), DSCOVER will be shipped to the Astrotech Space Operations (ASO) Payload Processing Facility (PPF) in Titusville, FL for final testing/processing and integration with the Falcon 9 Launch Vehicle.

Scope

The contractor will provide support for DSCOVER Project/Pre-launch meetings, launch operations/processing support, and launch site support, as required. The contractor will have detailed knowledge of KSC, GSFC, CCAFS, ASO and NOAA capabilities, processes and operations. The contractor will have detailed knowledge of developing/evaluating all launch site documentation, as required.

Specific Task

The contractor shall perform and/or assist the DSCOVER Project Manager for the following functions:

1. Support DSCOVER Project and Mission Integrated/Ground Operation/Launch Operation Working Group (MIWG/GOWG/LOWG) meetings at various locations.
2. Prepare, coordinate, develop and/or review launch/range documentation.
3. Develop/coordinate/review internal and external KSC, ASO, CCAFS, NASA/GSFC, NOAA, data and voice communication interfaces.
4. Coordinate NASA/GSFC, CCAFS, NOAA and KSC resources and facilities for DSCOVER Project support.
5. Develop/coordinate/implement/test facilities requirements for each processing location.
6. Support the DSCOVER Project during the various field operations.
7. Support the DSCOVER Project at the launch site.

Deliverables

The contractor shall provide a monthly status report to the Task Technical Monitor

The contractor shall provide a monthly cost report to include total monthly and cumulative travel costs.

GSMO TASK ORDER

Task No: 67
Modification: 4
Task Name: SSMO Integrated Multi-Spacecraft Operations Dashboard
Task Period of Performance: 03/01/2013 through 04/30/2016
Modification Period of Performance: 05/01/2015 through 04/30/2016
GSMO SOW Reference: 3.6, 3.7

I. Task Order History

This is modification 4 to the task order Statement of Work (SOW) for the SSMO Integrated Multi-Spacecraft Operations Dashboard..

Mod #	Start	End	Brief Description
0	03/01/2013	12/31/2013	Initial SOW and iMST tool prototype
1	09/03/2013	04/30/2014	Expand and leverage the current Timeline software and architecture into a broader, more capable SSMO dashboard by displaying up-to-date key telemetered values of the state and health of each spacecraft.
2	05/01/2014	04/30/2015	Continue to sustain and enhance the dashboard, broaden the capabilities – take advantage of technology enhancements to improve the product.
3	08/01/2014	04/30/2015	Additional SatCam and Space Weather data to the Dashboard.
4	05/01/2015	04/30/2016	Extend period of performance for one-year. Add support to enhance the Data Access Tool (DAT).

II. Background

This Task Order (TO) Statement of Work (SOW) provides scope to develop tools in support of the SSMO Integrated Multi-Spacecraft Operations Dashboard. The initial task SOW defines the work required to rapidly develop a working prototype of the Integrated Multi-Spacecraft Timeline (iMST) for Flight Operations Teams and SSMO management. The iMST will remotely provide a timeline view of operational events for specified SSMO spacecraft. In addition, iMST will securely allow authenticated and authorized users to view historical, current and planned spacecraft events. iMST may allow authorized users to view a specified set of ground and space based events.

III. Scope of Work

The Contractor shall develop a working prototype of the iMST as outlined in the requirements section of this SOW.

1. The Contractor shall proactively seek and determine iMST stakeholders.
2. The Contractor shall proactively elicit, document, analyze and prioritize iMST requirements.
3. The Contractor shall develop an architecture and initial design of iMST.
4. The Contractor shall investigate the availability and use of pre-existing SSMO hardware.

5. The Contractor shall acquire appropriate software to implement the iMST design.
6. The Contractor shall implement a capability to receive, archive, ingest and visualize event types (e.g. AOS/LOS).
7. The Contractor shall plan for system security based on access control and role based capabilities.
8. The Contractor shall develop iMST as a secure rich internet application that leverages a web services approach.
9. The Contractor shall design and implement iMST using an open architecture, leveraging open source languages, open standards, open specifications and open protocols.
10. The Contractor shall ensure that implemented software design patterns decouple visualization, from modeling and from controlling of the iMST.
11. The Contractor shall leverage the use of a secure open source web application framework, with configurable and granular role based authentication and authorization levels for users and groups.
12. The Contractor shall ensure that iMST is useable with a federated authentication and authorization system.
13. The Contractor shall ensure that iMST is operating system independent.
14. The Contractor shall ensure that the user interface to iMST is a secure and HTML5 compliant web browser.
15. The Contractor shall ensure that iMST is maintainable, scalable and extensible.
16. The Contractor shall ensure that iMST can autonomously and manually ingest specified spacecraft and ground based events.
17. The Contractor shall ensure that iMST logs user and system activities.
18. The Contractor shall collaborate with external parties (e.g., JPL) as appropriate.
19. The Contractor shall proactively elicit, document, analyze and prioritize dashboard requirements.
20. The Contractor shall select key spacecraft-specific telemetered values to be included on dashboard (through collaboration with Mission Directors and MOC interface SMEs).
21. The Contractor shall develop a generic user interface display template for key telemetered values, then customize the template for each SSMO mission to be displayed on the dashboard.
22. The Contractor shall implement the capability to receive up-to-date key telemetered values for each spacecraft and to visualize the values on the dashboard.
 - a. The Contractor shall continue to add events to the Dashboard's Timeline (e.g. LRO dh maneuvers, ACE, SOHO, and WIND maneuvers, etc.)
23. The Contractor shall plan for system security based on access control and role based capabilities.
24. The Contractor shall merge Timeline Build 1 and 2 capabilities into the Timeline – Initial Release.
25. The Contractor shall complete Acquisition, Extraction, Transformation and Loading (AETL) of data into a Timeline – Fully Populated Release.
26. Evaluate a web services capability for General Mission Analysis Toolkit (GMAT).
 - a. The Contractor shall further enhance GMAT capabilities within the Dashboard.
27. The Contractor shall integrate SatCam and Space Weather data to the Dashboard.
 - a. The Contractor shall further enhance SatCam capabilities (e.g. MMS formation display, ground-track, etc.) within the Dashboard.
 - b. The Contractor shall further Space weather capabilities within the Dashboard
28. Data Access Toolkit (DAT) support.
 - a. The Contractor shall lead, organize, and coordinate all necessary interfaces between the MOCs and DAT.

- b. The Contractor shall evaluate, design, architect and implement a role based authorization system for DAT.
 - c. The Contractor shall integrate LaunchPad authentication with DAT>
 - d. The Contractor shall elicit and incorporate stakeholder feedback, including project sponsors and FOT, on needed enhancements to DAT's user interface and user experience.
 - e. The Contractor shall evaluate DAT's architecture for usability, portability, reliability, scalability and extensibility.
 - f. The Contractor shall evaluate the technical challenges of using AWS's Glacier for storage and data retrieval.
 - g. The Contractor shall enhance and optimize DAT's infrastructure on AWS GovCloud.
29. The Contractor shall schedule and hold mission specific presentations and demonstrate Dashboard capabilities.
30. The Contractor shall evaluate FreeSpace as an addition to the Dashboard

A. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

B. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The contractor will identify any government furnished software, hardware, and/or facilities that it needs to perform the work of this task. No such needs have been assumed.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

The contractor shall proposed conference related travel as appropriate to support the collaborative development of the operations dashboard.

Potential conferences:

GSAW 2015: <http://csse.usc.edu/gsaw/>

ESAW 2015: <http://congrexprojects.com/13a08/registration>.

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Plans, schedules, as appropriate	
2	Timeline - Initial Release	October 2013 (complete)
3	Timeline - Fully Populated Release	December 2013 (complete)
4	S&H Template Release	November 2013 (complete)
5	S&H Initial Population Release	February 2014 (complete)
6	S&H Fully Populated Release	April 2014 (complete)
7	Evaluation report for GMAT capabilities as a web service	September 2014 (complete)
8	Evaluation report for SatCam capabilities as a web service	October 2014 (complete)
9	Initial release of Space Weather's integration into SSMO Dashboard – Release 201502.000	January 2015 (complete)
10	Dashboard Fully Operational Release	Final Version April 2015

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: 68
Modification: 3
Task Name: GOES-R IT Security Support
Task Period of Performance: 03/15/2013 to 06/30/2016
Modification Period of Performance: 07/01/2015 to 06/30/2016
GSMO SOW Reference: 3.7.2.3 - System Administration and IT Security

I. Task Order History

Description of modifications:

Mod #	Start	End	Brief Description
0	03/15/2013	06/30/2013	Initial task order SOW
1	07/01/2013	06/30/2014	Continuation of initial effort and yearly assessment cycle preparations
2	07/01/2014	06/30/2015	Continuation of effort and yearly assessment cycle preparations
3	07/01/2015	06/30/2016	Continuation of effort and yearly assessment cycle preparations

II. Background

The Geostationary Operational Environmental Satellite – R Series (GOES-R) program is a key element to meeting the National Oceanic and Atmospheric Administration (NOAA) mission. The advanced spacecraft and instrument technology used on the GOES-R series will result in more timely and accurate weather forecasts. It will improve support for the detection and observations of meteorological phenomena and directly affect public safety, protection of property, and ultimately, economic health and development. The first launch of the GOES-R series satellite is scheduled for March 2016.

III. Scope of Work

The Contractor shall provide IT security support to the GOES-R in the form of review of IT security documentation, IT security system assessment with regard to compliance to all applicable standards, update of all plans and security controls as necessary, and participation in Authorization and Accreditation audit activities.

A. Requirements

- A.1. The contractor shall provide independent review of existing GOES-R Information Technology (IT) Security documentation (System Security Plan, Risk Assessment, Contingency Plan, POAMs and supporting documentation in the RMS database).
- A.2. The contractor shall conduct a system assessment for IT Security control compliance with NIST SP 800-53 Revision 4 and NASA IT policies directives of the OCIO ITS-HBK IT security policy handbooks.
- A.3. The contractor shall develop new IT Security control implementations as required. Develop Plans of Actions & Milestones (POAMS) as required for any control that does not meet NIST SP800-53 Revision 4 compliance.

- A.4. The contractor shall update RMS database System Security Plan, Risk Assessment, Contingency Plan, POAMs and supporting documentation in the RMS database POAM records with implementation changes as needed to document item 3 above.
- A.5. The contractor shall participate in Authorization & Accreditation (A&A) meetings with Code 700 auditors during the Task Order performance term.
- A.6. The contractor shall assist in resolution of findings identified during the 2014 (A&A) assessment.
- A.7. The contractor shall review Q-Radar logs on a weekly basis and report identified abnormalities.
- A.8. The contractor shall aid in the development of GOES-R Standard Operating Procedures and Local Operating Procedures that align the GOES IT system with its Code 400 counterparts as their necessity becomes apparent during Directorate-level interface meetings

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

There are no Government furnished facilities, equipment, or software associated with this Task Order.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

N/A

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Descriptions	Due Date
1	Draft Continuous Monitoring Plan	April 5, 2016
2	Draft IT Security Documentation Updates	April 5, 2016
3	Final Continuous Monitoring Plan	April 26, 2016
4	Final IT Security Documentation Updates	April 26, 2016
5	Final POAM Updates in RMS	May 31, 2016
6	Monthly Report	15 th of Each Mo.

7	Q-Radar Abnormality Reports	As Required
---	-----------------------------	-------------

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: 69
Modification: 8
Task Name: SSMO Centralized Operations Facility
Task Period of Performance: 04/01/2013 through 09/30/2015
Modification Period of Performance: 08/01/2015 through 09/30/2015
GSMO SOW Reference: 2.2, 2.3.1, 2.3.2

I. Task Order History

This is the task order Statement of Work (SOW) for the SSMO Centralized Operations Facility (COF).

Mod #	Start	End	Brief Description
0	04/01/2013	09/30/2013	Initial SOW for the COF Lifecycle-Cost/Benefit Analysis
1	10/01/2013	02/28/2014	Expand upon requirements for the notional architecture of the COF and define a detailed architecture and a phased implementation approach for the COF
2	12/01/2013	02/28/2014	Add scope to include network and IT resources architectural considerations
3	03/01/2014	03/31/2014	One month No-cost extension
4	04/01/2014	06/30/2014	Three month No-cost extension
5	05/01/2014	09/30/2014	Add a subtask to develop a Multi-Mission MOC infrastructure for the SSMO COF
6	10/01/2014	09/30/2015	Extend period of performance, complete subtask development, investigate and demonstrate multi-mission services.
7	06/01/2015	09/30/2015	Add scope to Subtask 2 for a backup solution for the SSMO/VM.
8	08/01/2015	09/30/2015	Add scope to Subtask 2 for an extension of the existing SSMO/VM environment.

II. Background

This Task Order (TO) Statement of Work (SOW) provides scope to develop a lifecycle-cost/benefit analysis of the Centralized Operations Facility (COF) for Flight Operations Teams under the auspices of the Space Sciences Management Office (SSMO). A fully implemented COF will provide an integrated capability to perform flight operations for all Goddard-based spacecraft through the use of multi-tenancy, abstraction and virtualization.

High level needs of the COF include:

- The COF baseline architecture needs to incorporate lessons learned from the development of the integrated Multi-Spacecraft Timeline (iMST).
- The COF design needs to be based on a unified graphical user interface to allow for maximum efficiency through cross-training and operations of FOT staff.
- The COF should be developed as a secure environment that leverages the web services approach.
- For maximum cost effectiveness, the COF architecture needs to include multi-tenancy, abstraction and virtualization that facilitates sharing of human resources and skill sets.

- The COF baseline architecture needs to accommodate current and projected software used for MOC functions.
- To the extent practicable, the COF must be developed using an open architecture, leveraging open source languages, open standards, open specifications and open protocols.
- To reduce long-term risk, the COF architecture should be maintainable, scalable and extensible.
- To facilitate modularity, the COF baseline architecture needs to decouple front-end visualization from back-end processing.
- To the maximum extent possible, the COF baseline architecture should incorporate sharing of software, hardware and facilities.

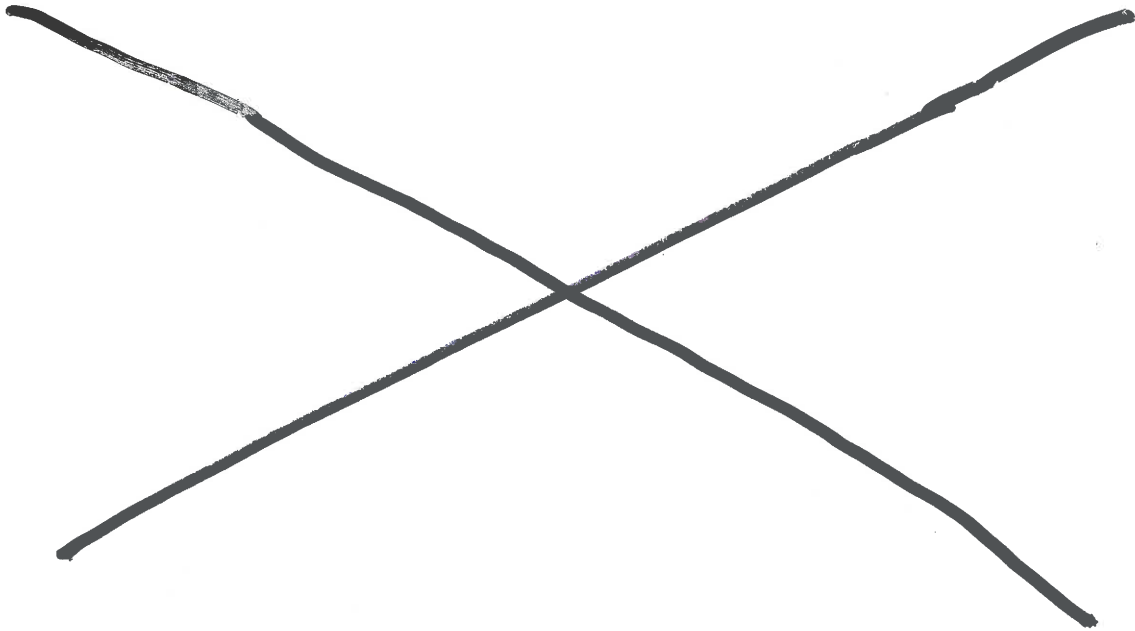


Figure 1 : A high-level boundary diagram of the COF

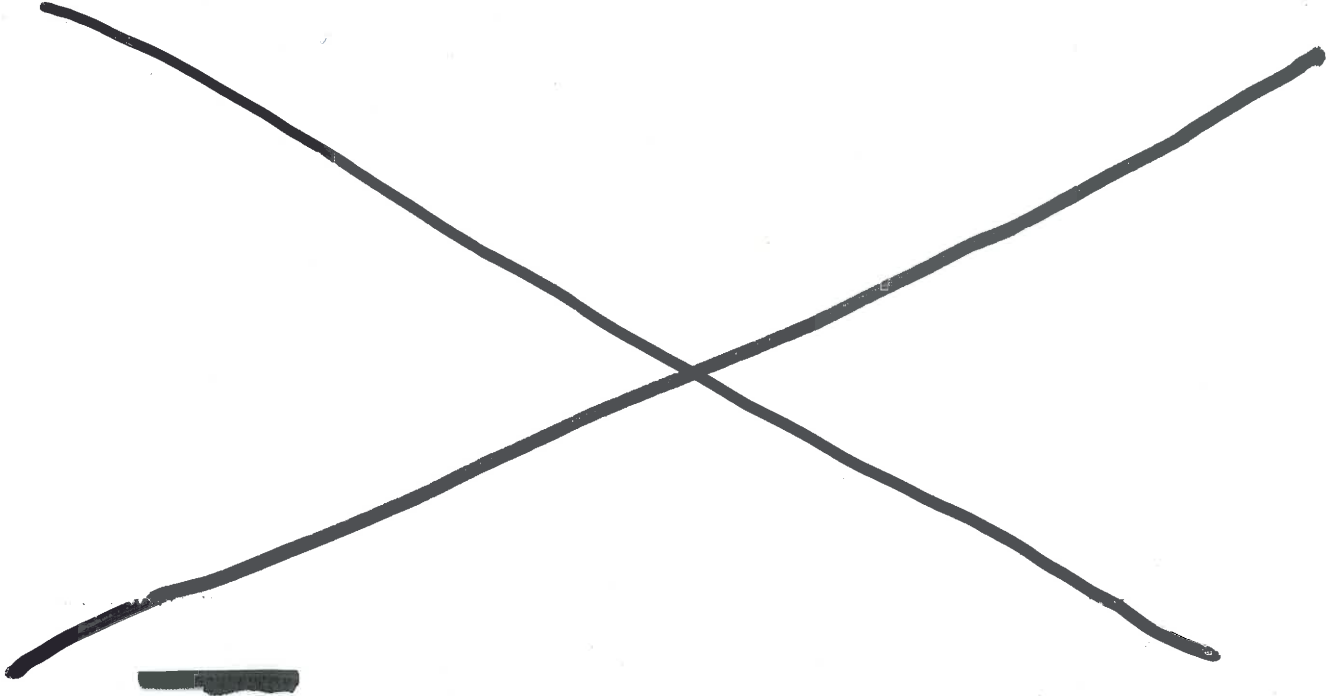


Figure 2: Notional Architecture of the Integrated Multi-Spacecraft Operations Facility (COF)

III. Scope of Work

The Contractor shall perform the following requirements of this SOW.

SUBTASK 1: Develop architecture studies and Lifecycle-Cost/Benefit Analysis of the COF

1. Conduct a parameterized lifecycle-cost/benefit study over a 10 year time horizon where the free parameters are number and complexity of missions operated in the COF. The study shall account for the following project elements
 - a. Status Quo alternative – Develop projected Operations and Maintenance (O&M) costs for continued distributed and stove-piped Mission Operations Centers across Goddard Space Flight Center
 - b. Development and Implementation Costs – Provide a most likely case cost estimate for the development and implementation of the COF, including probability bands and cost/schedule risks
 - c. Mission tailoring costs - Provide most likely cost estimates associated with any customization for mission unique requirements for new missions targeting operations in the COF during formulation
 - d. Mission reengineering costs - Provide most likely cost estimates for missions in Phase E targeting a transfer from a stand-alone MOC to the COF
 - e. COF Operations Costs – develop an O&M staffing profile and cost estimate for the COF for the GSFC-based spacecraft fleet (accounting for new launches and older spacecraft fly-outs).
2. Document and analyze Level 1 COF requirements

3. Develop a boundary diagram noting which flight operations functions will be conducted within the COF and those which will be performed by external organizations.
4. Develop a comprehensive description of known interfaces including expected data flows, formats, and required network topology.
5. Develop operational use cases for major COF activities, including developing a workflow for MOC activities, specifically including authentication, maneuver planning, and a command load for one of the GSFC spacecraft
6. Develop a baseline architecture of the COF to drive the cost estimation effort,
7. Develop an optimized Flight Operations Team staffing profile for the COF, including labor categories and functions
8. Document risks to the COF development/implementation effort.
9. Develop network and IT resources architectural considerations. For each of these considerations, present options with their advantages/disadvantages and cost implications:
 - a. Consideration of network topology for the COF. (e.g., presence on the IONet, COF VLANs, other?)
 - b. Consideration of virtualization technologies.
 - c. Consideration for a potential role for commercial cloud services such as AWS/GovCloud.
10. Demonstrate high-volume multi-mission operations while a new mission is provisioned into the COF
11. Collaborate with other Mission Operations Services development/implementation efforts (e.g. GMSEC) to leverage technologies for the COF
12. Refine the current architecture model to enable cost estimation analysis, including proposed implementation phasing
13. Create a higher-fidelity cost model to determine Return on Investment/ Net Present Value benefits to NASA

SUBTASK 2: Develop a Multi-Mission MOC infrastructure for the SSMO COF

1. The Contractor shall develop and implement a Virtual Machine (VM) Infrastructure capable of supporting multiple SSMO Mission Operations Centers (MOC); with the initial capacity to support the Fermi and Multi-Mission MOCs. The Contractor shall provision VMs to Fermi and Multi-Mission Systems Administrators (SA); and provide technical support to the MOC SAs to establish IONET connectivity and for effective utilization of VMs in their environment.
2. The Contractor shall provide Fermi-Unique materials (e.g. hardware, software, licenses) necessary to support transition to VM, and hardware refresh for systems that will not be migrated to VMs, as identified from the Fermi Refresh Testbed. Multi-Mission-Unique materials have not yet been identified, and will be funded separately.
3. The Contractor shall provide 12 thin clients for Multi-Mission MOC to provide console access to planned SSMO-VM Virtual Machines.
4. The contractor shall expand the capabilities of the SSMO VM infrastructure by building/providing IT tools and services to be used by all tenants of the environment. These services are to include but are not limited to
 - Backup service for all filesystems and virtual machines in the environment
 - Versioning service to track different copies of process, procedures, applications, etc
 - Issue tracking service to track action items, error reporting and assignments
 - Content management publishing and configuration control
 - Collaboration tools such as Wiki's and notification systems
 - Automated workflow management tools and security services

5. The contractor shall expand the capabilities of the SSMO VM infrastructure by providing and building additional nodes to the existing cluster and create a parallel cluster in Building 32. This parallel cluster will be used as a redundant/backup to the prime cluster and will allow for the migration of the SDO and LRO MOC environments into these VM clusters.

A. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The contractor will identify any government furnished software, hardware, and/or facilities that it needs to perform the work of this task. No such needs have been assumed.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Concept Review for the Lifecycle-Cost/Benefit Analysis of the COF	June 2013 (complete)
2	Lifecycle-Cost/Benefit Analysis of the COF (DRAFT Report)	Aug 2013 (complete)
3	Lifecycle-Cost/Benefit Analysis of the COF (FINAL Report)	Sep 2013 (complete)
4	Detailed architecture and phased implementation approach for the COF	Feb 2014 (complete)
5	Detailed Plan/Approach presentation	October 30, 2014
6	Present refined COF architecture	March 31, 2015
7	Demonstrate new mission provisioning in the cloud	April 30, 2015
8	Present high-resolution cost model	July 30, 2015
9	Demonstrate new mission provisioning in Fermi h/w	September 30, 2015
10	<i>Interim Restricted IONET Connectivity to SSMO VM Environment</i>	<i>November 3, 2014</i>

11	<i>Provision VMs for MMOC</i>	<i>December 8, 2014</i>
12	<i>Operational Readiness Review for SSMO VM Environment</i>	<i>February 2, 2015</i>
13	<i>Full IONET Connectivity to SSMO VM Environment</i>	<i>March 2, 2015</i>

End of Task Order Statement of Work

GSMO Task 70, Mod 2 JPSS IDPS Ground System Support

GSMO TASK ORDER

Task No: #70
Modification: 2
Task Name: JPSS IDPS Ground System Support
Task Period of Performance: 04/15/2013 to 03/31/2016
Modification Period of Performance: 04/01/2015 to 03/31/2016
GSMO SOW Reference: 2.1

I. Task Order History

Description of current modification (Modification 2): Extension to Task Order for Task #70.

Mod #	Start	End	Brief Description
0	4/15/2013	3/31/2014	Initial task order statement of work.
1	4/1/2014	3/31/2015	Extend period of performance through Mar 31, 2015.
2	4/1/2015	3/31/2016	Extend period of performance through Mar 31, 2016.

II. Background

The Joint Polar Satellite System (JPSS) mission is to provide military and civilian agencies with environmental, meteorological, and climatological data and products. The JPSS Ground Project provides mission support capabilities to a heterogeneous constellation of national and international missions including Suomi NPP, JPSS, European Organization for the Exploitation of Meteorological Satellites' (EUMETSAT) Meteorological Observation Program (METOP), Defense Meteorological Satellite Program (DMSP), Japan Aerospace Exploration Agency's (JAXA's) Global Change Observation Mission-Water (GCOM-W), and Windsat. The Common Ground System (CGS) provides command and control of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) and JPSS spacecraft and instruments. The CGS transports commands, telemetry, and mission data between the space, ground control, and processing facilities and the Customer locations, and enables mission planning, asset management, and delivery of the mission products. Interface Data Processing Segment (IDPS) is part of the Common Ground System (CGS). The Interface Data Processing Segment (IDPS) is responsible for the receipt of raw mission data from C3S and for creating and delivering useable environmental products to Users. IDPS ingests Stored Mission Data (SMD) received from C3S – the artifacts from satellite on-board storage and ground communication routing are removed prior to arrival at the IDPS. The initial ingest processing providing raw data records (RDR; per sensor/channel raw bits) that are subsequently processed to create Sensor Data Records (SDR; geolocated and calibrated samples), Temperature Data Records (TDR), deliverable Intermediate Products (IP), and Environmental Data Records (EDR; higher level products). The RDR, SDR, TDR, deliverable IP, and EDR products are made available to user systems, for use in application specific, weather related predictions.

Summary of work:

Develop IDPS Operations Agreements (OA) to establish, define and characterize the operational interaction between the IDPS and data consumers. Track urgent IDPS Discrepancy Reports (DR) found in operations and test environments; responsible for follow up through closure. Manage the internal IDPS Staff (IIS) Meeting which includes developing and distribution of the meeting agendas, summaries and action items list. Participate in the review of the COTS baseline progress. Coordinate response time of the JPSS Interface Data Processing Segment (IDPS) team

GSMD Task 70, Mod 2 JPSS IDPS Ground System Support

inputs for the Mission Information System (MIS) Configuration Change Requests (CCR) reviews and other reviews.

The contractor shall provide systems engineering support to define Ground System Interface Data Processing Segment operational interfaces agreements. Coordinate IDPS Discrepancy Report management through the Ground Mission Discrepancy Review Board. Manage the internal IDPS staff meeting – develop/distribute agendas, summaries and track action items. Participate in review of COTS baseline, coordinate response of Mission Information System (MIS) Configuration Change Requests (CCR) reviews, as well as other reviews.

III. Scope of Work

The contractor shall provide a newly deployed CDS environment with associated administrative support for use by the JPSS Ground Project Discrepancy Review Board, and shall perform support services in the Ground Project systems area.

A. Requirements

- A.1. The contractor shall provide systems engineering support to define Ground System Interface Data Processing Segment operational interfaces agreements.
- A.2. The contractor shall provide engineering support for the IDPS Discrepancy Report management through the Ground Mission Discrepancy Review Board.
- A.3. The contractor shall provide manage the internal IDPS staff meeting – develop/distribute agendas, summaries and track action items.
- A.4. The contractor shall provide engineering support in review of COTS baseline, response to Mission Information System (MIS) Configuration Change Requests (CCR) reviews, as well as other reviews

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The Contractor shall assist the GSMD contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The Government shall provide furnished office space for personnel in support of Subtask 1 and 2.

The contractor shall provide laptop computer equipment needed to perform the task in an effective manner, unless provided by the JPSS Ground Project at the customer's discretion. This shall include the standard software application suite used at GSFC. Any special software applications needed to perform the task (e.g. Microsoft Project) will be provided as GFE. Additionally, the laptop shall be compliant to NASA Security requirements and subject to NASA security configuration and audits as necessary.

GSMO Task 70, Mod 2 JPSS IDPS Ground System Support

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

The contractor will be required to support technical reviews/meetings in Colorado in support of Subtasks 1. The contractor shall prepare an estimate for this travel as part of their response to this SOW. For planning purposes, the contractor will support on the order of sending 1 person 3 times to Denver, Colorado to support various status reviews and prototyping technical interchange meetings. The contractor shall include an estimate for this local travel as part of their response to this SOW.

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Weekly Technical Status	
2	Monthly Management Report	

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: 71
Modification: 3
Task Name: Programmatic and Technical Support to Earth Science Division
Task Period of Performance: 4/22/2013 to 3/31/2015
Modification Period of Performance: 4/1/2015 to 3/31/2016
GSMO SOW Reference: 2.1, 2.2

I. Task Order History

Description of current modification (Modification 3): Extension to Task Order for Task #71.

Mod #	Start	End	Brief Description
0	4/22/2013	3/31/2014	Initial task order statement of work.
1	4/1/2014	3/31/2015	One year extension to the task order.
2	12/1/2014	3/31/2015	Add additional scope and hours
3	4/1/2015	3/31/2016	One year extension to the task order.

1.0 PURPOSE

The purpose of this task is to provide programmatic and technical support to the NASA Headquarters Earth Science Division.

2.0 REQUIREMENTS

The contractor shall ...

2.1 Support NASA involvement and interaction with interagency / international organizations, advisory committees and groups (e.g. Committee on Earth Observation Satellites, Group on Earth Observations, IOAG, USGCRP)

- 2.1.1 Compile and track NASA action items and responses for teams such as the USGCRP Climate Assessment Working Group.
- 2.1.2 As requested, support NASA representatives and international groups (e.g. CEOS) developing, compiling, reviewing, editing and completing documents and plans, including suggesting methods to solicit and disposition comments.
- 2.1.3 Support review of external documents requiring NASA input; Collect and integrate material for submission/response.
- 2.1.4 Assist with development of white papers and recommendations for consideration or use by groups.

2.2 Program Management, Planning and Communications Support

- 2.2.1 Provide analysis and recommendations for program planning and program management processes/approaches; Support implementation of recommendations as requested.
- 2.2.2 Support preparation of program documents, briefings and reviews.
- 2.2.3 Compile information and conduct analyses and assessments of programs/projects (including project portfolios) to support tracking, management decisions, etc.
- 2.2.4 Provide communications planning support and development of communications materials (e.g. Annual Reports, brochures, web pages). Periodically review and update program or project information web sites.
- 2.2.5 Organize program and project management review meetings, making logistic arrangements for the meeting and prepare meeting minutes after the meeting.
- 2.2.6 Periodically review program/project management web sites and tools. When needed, provide analysis on new requirements for program/project management web sites.

2.3 Special Studies and Analyses

- 2.3.1 Conduct ad hoc studies, special analyses, benchmarking and best practices studies.
- 2.3.2 Perform reviews/analyses of programs and special topics as requested.

3.0 TRAVEL

Travel required to provide support under this task will be approved by the TM or designee.

4.0 PROJECT DELIVERABLES:

The following deliverables will be provided under this task order.

- Contract Status or Activity Report in accordance with contract instructions
- Monthly Progress Reports
- Informal Biweekly Progress Reports with task leads or designees

5.0 WORK LOCATION:

The primary location for the required support described in this task is at NASA Headquarters, though some work may be performed remotely. A work space at NASA Headquarters may be provided for contractor staff.

GSMO TASK ORDER

Task No: 73
Modification: 7
Task Name: Landsat 8 Flight Operations and Ground Systems Support
Task Period of Performance: June 1, 2013 – May 31, 2016
Modification Period of Performance: July 1, 2015 – May 31, 2016
GSMO SOW Reference: Section 3

I. Task Order History

Description of current modification (Modification 6): This is a continuation of the task for Landsat 8 operations under the GSMO contract.

Mod #	Start	End	Brief Description
0	6/1/2013	5/31/2014	Initial task order statement of work.
1	10/31/2013		Administrative Modification.
2	12/1/2013	5/31/2014	Provide technical interface to the MOC software maintenance vendor(s) and remove orbit crossing deliverable.
3	6/1/2014	5/31/2015	Extend PoP. Incorporate scope of TO74 Landsat 8 Ground Systems Infrastructure Support (TO74 ends 5/31/2014)
4	10/2/14		Administrative Modification.
5	4/13/2015	5/31/2015	Assume lead role for MOC Refresh and sustain the MOC systems (to take effect 5/15/2015). Procure remaining hardware and software for MOC Refresh.
6	6/1/2015	5/31/2016	Extend PoP.
7	7/1/2015	5/31/2016	Incorporate software sustaining engineering support for the ITOS, DMS, FlexPlan, and Archiva subsystems for the period.

II. Background

Before transition to operations, the Landsat 8 mission was known as the Landsat Continuity Data Mission (LDCM) and is a component of the Landsat Program conducted jointly by NASA and USGS of the Department of the Interior.

The Landsat 8 is the successor mission to Landsat 7. Landsat satellites have continuously acquired multi-spectral images of the global land surface since the launch of ERTS 1 (Earth Resources Technology Satellite 1) in 1972. The Landsat 8 mission objective is to extend the ability to detect and quantitatively characterize changes on the global land surface at a scale where natural and man-made causes of change can be detected and differentiated.

The Landsat 8 Operations consist of two elements: the Space Segment and the Ground Segment. The Space Segment (SS) consists of the observatory ground support equipment (GSE). The observatory consists of the spacecraft and two instruments. The Landsat 8 Ground Support Equipment includes all of the ground-based assets needed to operate the Landsat 8 observatory. The primary components of the Ground Support Equipment are the Mission Operations Element,

Collection Activity Planning Element, Ground Network Element, and the Data Processing and Archive System.

The spacecraft contains typical earth observing spacecraft functionality and supplies ancillary data to the instrument suite necessary to meet mission and imaging requirements. The primary instrument, the Operational Land Imager (OLI), is required to provide nine spectral bands with a maximum ground sampling distance. The second instrument is the Thermal Infra-Red Sensor (TIRS) which has a similar cross track swath width but a ground sample distance of 120-m for two bands.

Imaging sensor and ancillary data (combined as mission data) are to be collected, stored onboard and subsequently down-linked to ground stations within the Landsat Ground Network (LGN) via an X-band communications link. Additionally, an X-band downlink capability transmits mission (imaging sensor and ancillary) data to the LGN and International Cooperators (ICs) equipped to receive these data. The observatory receives and executes commands and transmits real-time housekeeping telemetry via an S-band link to the LGN. The SS is capable of S-Band communications with the NASA Near Earth Network (NEN). S-Band only operations may be conducted with the Space Network (SN). Both of these networks are used as needed to support launch, early orbit, and contingency operations at the lower data rates.

Operations are conducted at GSFC. The Contractor is required to interface closely with the USGS personnel located at GSFC and in the mission management office (MMO) in Sioux Falls.

III. Scope of Work

The Contractor shall perform flight operations, system maintenance, testing, and sustaining engineering activities in support of the on-orbit Landsat 8 spacecraft and payload. Contractor support of flight operations includes tracking observatory state of health, executing planned real time operations, supporting special observatory activities, and investigating/resolving anomalies. The Contractor shall also be responsible for operating and maintaining the elements of the Mission Operations Centers (MOCs) ground systems. Additionally, the Contractor shall operate the elements of the backup Mission Operations Center (bMOC). The Contractor is also to maintain a training and certification plan which covers the scope of work.

The Contractor shall provide sustaining engineering, network engineering, network administration, systems and database administration, facility, installation, and integration support for the Landsat-8 Ground System, focusing on the Mission Operations Center (MOC) facilities, hardware and software. The Contractor shall provide:

- MOC user support
- Installations or reconfigurations
- Infrastructure support
- Facility support (environmental monitoring and other services not covered by GSFC facility engineers or contracts)
- Vendor service agreement management

Upon the request of the USGS Flight Systems Manager (FSM), the Contractor shall support feasibility and technical studies related to Landsat operations concepts, Landsat science image acquisition, Landsat legacy and follow-on missions, and collaborative mission and multi-mission approaches with other Landsat missions.

The work to be performed shall be carried out under direction of the GSMO Task Manager (USGS Flight Systems Manager). For normal operations, the GSMO Task Manager will approve all

procedures used to operate and maintain the spacecraft, payload and space/ground support activities. During special and contingency operations, the FSM or designate will review and approve all planning, execution and post-event analysis.

A. Requirements

A.1. Flight Operations Support

The Contractor shall perform operations of the on-orbit Landsat spacecraft. This includes all activities necessary to maintain spacecraft and instrument health and safety while working to achieve the objectives of the mission, provide daily operational continuity and perform on-going monitoring, analysis, configuration, troubleshooting, performance reporting and operation of onboard and ground systems. When required the Contractor will develop tools or automation to enhance or work-around operational issues. Planning, rehearsal, execution and post-event analysis shall also be performed for special events such as orbital maneuvers and infrequent activities. Select periodic activities will require the Contractor to support proficiency tests to validate the MOC configuration and procedures. Finally, the Contractor shall be responsible for the planning, rehearsal, execution and evaluation of contingency operations through its Flight Operations Team (FOT) and sustaining engineering activities.

A.3. Observatory Subsystems and Associated Operations

The Contractor shall plan, rehearse, perform and assess real-time, special and contingency operations which involve or impact an Observatory subsystem. The Contractor shall support Landsat 8 operational engineering and functional analysis of, at a minimum, the Attitude Control System, Electrical Power System, Command and Data Handling System, Instruments (OLI & TIRS), Propulsion, Telecommunications Systems, Fault Management, Thermal Systems, and Flight Software. The Contractor shall write and maintain standard operating procedures for these activities. Special operations support can include developing new operations concepts and modifying or testing new flight constraints. The Contractor shall be responsible for scheduling and executing periodic maintenance of onboard systems as defined in standard operating procedures. Associated ground configuration parameters (paging, limits, displays) are to be managed and updated as to match the configuration of the observatory.

The Contractor shall also provide observatory status reporting on health, events, activities, items being monitored, and planned activities on a weekly basis.

A.3. Real-time and Support Operations

The Contractor shall support all real-time operations of the satellite from both ground and space networks. Real-time operations consist of those activities that are necessary to support direct communication with the spacecraft and include pre/post-pass operations, telemetry acquisition, tracking and command, orbit and attitude maintenance maneuvers, system configuration, observatory state of health assessment, housekeeping telemetry processing, command load uplink and verification, table and memory load/dump operations and management of the Solid State Recorder (SSR) to capture and downlink all science and spacecraft engineering data. Support operations are those offline activities that are necessary to support the safe and nominal operation of the spacecraft and include planning and scheduling, orbit determination and maneuver planning, stored command load generation, and trending and statistical analysis of observatory performance. The Contractor shall write and maintain standard operating procedures for these activities.

The Contractor shall perform the planning and scheduling function for Landsat 8 by directly interfacing with USGS Data Acquisition Manager for input and providing schedule requests to the network scheduling system. The Contractor shall follow networks scheduling processes and

procedures to resolve scheduling conflicts and shall provide products to USGS as required supporting mission activities.

The Contractor shall secure adequate communications services through the Ground Network (GN) and Space Network (SN), or other government provided communications networks for the delivery of spacecraft and instrument telemetry to the ground and the commanding and tracking of the Landsat 8 spacecraft. Routine proficiency supports will be scheduled and executed by the Contractor.

The Contractor shall manage and update if necessary mission planning rules to generate conflict-free schedules to support activities for all spacecraft contacts, and required spacecraft special activities. The Contractor is to ensure that loads are verified prior to uplink and are uplinked in a timely manner prior to the load start. The Contractor shall support reviews of any special load products with an appropriate approval process (such as Command Authorization Meeting (CAM)).

The Contractor shall work to automate routine real-time and offline operations. The Contractor shall be required to develop scripts/procedures to enhance automation or work around operational issues - including double downlink of Real-Time (RT) files, Mission Data Management (MDM) paging alerts, automated post pass reporting, automated reporting of failed FDS prints, multiple line retransmits, and automated SSOH accounting. The Contractor shall be responsible for creating and executing a test plan prior to implementing updates operationally. Automation flow diagrams, steps or procedures are to be documented and flow charted for inclusion in the operations library.

During both manned and Lights-Out operations the Contractor shall maintain a console log and collect metrics on pass, automation, MDM, and ground system performance for weekly reporting.

A.4 Ground System Support and Sustaining Engineering

The Contractor shall perform ground system support and sustaining engineering of all MOC and bMOC ground systems required for operational use and support the FOT in all simulations and operations activities. These activities may include hardware and software maintenance, capability enhancement, system automation, testing, opscon development/refinement, and database maintenance of operational systems.

The Landsat 8 MOC/bMOC ground system currently includes:

- Attention!: Alert notification
- Archiva: Plot Generation
- CAPE: Science Planning
- DMS/RCR: Product delivery, archive, and approvals
- ITOS: T&C, Front end, and LFAT
- Flexplan: Mission planning software and mission rules
- Freeflyer: Flight dynamics
- LSIMMS and Simulators: Observatory support

The contractor shall sustain all MOC software. This includes maintaining the final MOC software delivery and providing future enhancements. In addition, the contractor shall maintain all required COTS/GOTS software licenses and MOC software documentation. (Refer to A.4.10.a Lead MOC Refresh).

The Contractor shall provide a technical interface to the MOC software maintenance vendor(s) to facilitate effective information and technical interchange between operations and software maintenance personnel, for efficient processes for requirements definition, enhancement

requests, problem identification and resolution, and MOC software sustaining engineering activities (Refer to Section IV. Government Furnished Facilities, Equipment, Software, and other Resources).

The contractor shall lead the MOC Refresh development, testing, and transition. (Refer to A.4.11 Lead MOC Sustaining Engineering).

The contractor shall procure remaining hardware, software, and vendor service agreements for the MOC Refresh.

A.4.1. Facilities

The building, Mission Operations Center (MOC), backup Mission Operations Center (bMOC), and environmental control for the MOC/bMOC will be provided by the Government, as will all networks, hardware and system software necessary to support flight operations activities and interfaces.

The Contractor shall monitor the environment of the mission operations and equipment rooms and provide other services not covered by GSFC facility engineers or contracts.

The Contractor shall perform facility implementation support for installation of power and data communications cabling and support hardware installation and basic facility modifications in the MOC facilities. The Contractor is required to maintain the appropriate safety training and gear used for the lifting, installation, delivery, and relocation of heavy materials and equipment, including but not limited to servers, racks, consoles, packages, and crates.

A.4.2. Equipment Preventative Maintenance and Support

The Contractor shall perform routine preventative maintenance and support for the MOC equipment as recommended by vendors and established standards. The contract shall implement improvements to MOC infrastructure services to improve reliability, efficiency, and IT security compliance. Personnel should be experienced with Cisco, Checkpoint, Active Directory, RSA, network management software, system and network log analysis, SNMP, proxy services and computer hardware maintenance.

The Contractor shall provide support to the Landsat 8 MOC to maintain the availability and reliability of the MOC Systems, including the MOE, CAPE, LSIMSS, S/OS, and Softbench. This also includes troubleshooting problems, escalating as necessary to MOC Sustaining organizations, and tracking issues through completion and resolutions of any issues that may impact operational activities.

The Contractor shall supply the administration, configuration management and sustaining engineering for all hardware needed to support the Mission Operations Center (MOC) spacecraft operations engineering, real-time engineering, and contract staff.

The Contractor shall support the FSM in gathering utilization statistics for MOC hardware. The Contractor shall work with the FSM or delegate to define a report structure that contains statistics such as system load averages and peak utilization periods.

A.4.3. Database Administration

The Contractor shall maintain the Project Reference Database (PRD) Project Reference Database System (PRDS). The PRD administrator maintains database translation

applications to convert the PRD to supported Commercial off the Shelf (COTS) and Government off the Shelf (GOTS) application formats. The PRD contains the Spacecraft Command and Telemetry Database, as well as the unique configuration settings for the COTS and GOTS software provided by the MOC Software Vendors. The PRDS is the repository for Configuration Managed and Development versions of the PRD, and a number of tools utilized to maintain the PRD.

A.4.4. Network Infrastructure Support

The Contractor shall provide sustaining support of the Landsat-8 MOC Network infrastructure and services, in order to maintain availability and reliability of services. The Contractor shall manage and troubleshoot MOC infrastructure services; configure infrastructure to accommodate new features, capabilities, and requirements; provide MOC account management; interfaced with NASA Integrated Services Network (NISN) for troubleshooting and new requirements.

A.4.5. Information Security

The Contractor shall ensure implementation of IT security standards as defined in the NASA and USGS IT security policies. The Contractor shall work with the Land Satellite Data Services (LSDS) security office to ensure all program security requirements are met. The Contractor shall perform necessary security scans on all equipment that is not located on the IONet (equipment on the IONet is scanned by IONet security officials as part of the USGS-to-NASA Interagency Operations Agreement and the IONet ISA).

All DOI systems are required to have continuous assessment and authorization (A&A). The USGS Land Satellite Data Systems (LSDS) will perform security management functions including key activities for assessment and authorization, gathering facts and ensuring the systems within the LSDS are compliant and reporting these to USGS management. As part of the Landsat Project, the Contractor shall support this effort by providing necessary documents, information, or other security activities as required. Additionally, systems supported by the Contractor may require specific controls for security, such as logon banners.

The Contractor shall report computer security incidents to designated Landsat Project staff. The Contractor shall assist EROS Landsat Satellite Data Systems (LSDS) security personnel in preparing for the on-going A&A effort, by providing content and evidence to be incorporated in the USGS Security Standard Operating Procedures (SOPs).

A.4.6. Electrostatic Discharge (ESD) Protected Area (EPA)

The Contractor shall provide routine monitoring and maintain the certification for the Electrostatic Discharge (ESD) Protected Area (EPA) containing the Spacecraft Simulator. Personnel should be familiar with Electrostatic Discharge (ESD) precautions for working around ESD sensitive equipment.

A.4.7. Vendor Service Agreements

The Contractor shall manage all applicable vendor service agreements for MOC Hardware, Operating Systems, and COTS applications, as required to meet support requirements and service levels. Management includes the procurement, tracking, and renewal of associated service agreements and licenses. The Contractor shall provide a list of all vendor warranty and maintenance including expiration dates. This may also include any recommended efficiencies for improvement of maintenance or cost savings.

For example, it may be advantageous to retain-in-place certain hardware as spares rather than maintaining it. The Contractor shall provide and maintain a hardware sparing plan.

A.4.8. Logistics, Property Management, and Configuration Management Support

The Contractor shall provide administrative and technical support for the logistics, property management, and configuration management for the MOC. The Contractor shall work closely with the USGS Landsat Property Manager and Landsat Project Manager to maintain the hardware inventory, process new hardware, process removal and disposition of old hardware, and the exchange of repaired components. The Contractor shall work within the MIS Flight Operations Configuration Change Request; including the maintenance of supplemental material (e.g., redlines, network diagrams, detailed installation plans, and installation notes). The Contractor shall maintain a media and paper documentation library for MOC Vendor and COTS software and hardware deliveries.

A.4.9. Office Automation Workstation Management

Office automation workstations utilized by MOC staff will be supplied by the Government and supported through NASA ACES. Workstations necessary to perform Mission Operations Center functions shall be supported by the Contractor to meet NASA and USGS system standards.

A.4.10. MOC Refresh

The MOC Refresh effort is for the replacement, modernization, and virtualization of the Landsat 8 MOC and bMOC systems. The Contractor shall support the design and implementation of the MOC Refresh. The contractor shall procure remaining hardware, software, and vendor service agreements for the MOC Refresh. The Contractor shall lead the integration and transition of the Refresh systems and operations into the Landsat 8 MOC and bMOC after delivery, and shall lead the design, testing, integration, and implementation of the operational network. The Contractor shall provide for any technical training required for the Operations and Maintenance for the Refresh.

A.4.10.a Lead MOC Refresh (effective May 15, 2015)

The contractor shall be responsible for completing the MOC Refresh, leading the development, testing, and transition. This includes:

- establishing MOC Refresh task leadership to assign tasks, track task status, manage schedule and resources
- closing out any subsystem/system configuration, TRAC tickets, testing, and procedure documentation
- conducting final MOC Refresh operational certifications and transitioning the MOC Refresh systems to routine operations
- decommissioning the legacy MOC systems after the MOC Refresh systems are operational

A.4.11. Lead MOC Sustaining Engineering (effective May 15, 2015)

The contractor shall sustain all MOC software. This includes maintaining the final MOC software delivery for MOE systems, and providing future enhancements. In addition, the contractor shall maintain all required COTS/GOTS software licenses and MOC software documentation.

A.5 Anomaly Detection, Isolation, Analysis and Recovery

An anomaly is defined as the occurrence of any event that causes the spacecraft, payload, data retrieval, or any of the ground-based support systems to perform in a non-standard manner

during any normal or special operation. An anomaly may occur in either on-orbit or ground-based elements of the flight operations system. The Contractor shall be responsible for maintaining a defined plan for escalating anomalies and using it to support anomaly resolution activities as defined in this section. When an anomaly is incurred, the Contractor shall summarize and report anomaly events within one business day to the FSM unless the incident is mission threatening – in which parties shall be notified immediately. When required, pre-approved response procedures are to be executed by the Contractor for defined anomalies as per the red limit database.

Support for Resolution of On-Orbit Anomalies: The Government is responsible for creating and managing an Anomaly Resolution Team (ART). In addition, the Government shall be responsible for any augmentation of technical staff to support anomaly analysis and recovery. The ART shall have lead responsibility for analysis of anomalies that are determined to be the result of the performance of an on-orbit system or subsystem, or a result of a procedural error. The ART is also responsible for providing root cause analysis and development of a corrective action recommendation to be given to the USGS FSM. The Contractor shall investigate/collect information, document, and participate in the analysis of such anomalies in support of the ART, when requested by the FSM. The Contractor shall also implement corrective actions as authorized by the FSM.

Support for Resolution of Ground-based Anomalies: Under [REDACTED] of the FSM, the Contractor shall have responsibility for investigating/collecting information, documenting, providing recommendations, and (where applicable) executing resolution of anomalies that are determined to be the result of performance or failure of a ground-based system or subsystem, or a result of procedural error.

Contingency operations procedures for likely or critical anomalies are to be written and maintained by the Contractor. Contingency operations procedures are to be version controlled and located in a central repository available for use.

After an anomaly the Contractor is to update documents, limits, page notifications, and procedures accordingly. The anomaly or event shall also be entered in the appropriate reporting system (i.e. SOARS, Teamtrack) within one week for tracking and disposition until closure.

The Contractor is also responsible for populating and maintaining the SOARS mission profile so that it reflects the Landsat 8 flight system configuration.

A.6 Trending and Analysis

The Contractor shall maintain, collect, and store all housekeeping and engineering data in a central mission repository. All Housekeeping and Engineering data collected from the observatory is to be available for use in a Government Furnished Equipment (GFE) trending analysis system which is to be maintained by the Contractor. The Contractor shall also manage, process, trend and analyze routine Housekeeping and Engineering data on a short term, long-term and periodic basis depending on the specific parameters and objectives. In addition, ad hoc reports shall be generated as needed to support anomaly investigations, maneuver planning, special operations, definitive reporting, and on-demand requests by the FSM or supporting Flight Segment engineers. The Contractor shall review observatory subsystem plots daily and hold an observatory wide trend review once per week.

A.7 Document Configuration and Maintenance

The Contractor shall provide a configuration management (CM) system that accurately defines the observatory, ground system, and operational procedures at any point of time. The CM of these items shall be tracked through the appropriate Configuration Control Board (CCB).

Hardware, software, database and document CM will be controlled utilizing USGS Landsat configuration management processes. The Contractor shall follow all documented procedures and guidelines in proposing, analyzing, implementing and recording changes to systems associated with the spacecraft and MOC.

The Contractor will follow established configuration management processes for all FOT products including documentation of new or updated products, peer review and internal sign off. The Contractor shall maintain full control of any changes to the ground system, spacecraft configuration and the approval of any activities relating to changes to any of the support elements or facilities within flight operations domain. The Contractor shall maintain a set of configuration controlled flight operations procedures, which include procedures for nominal, special and contingency operations.

The Contractor shall maintain documentation, plans and procedures as required supporting mission operations and mission support activities.

The Contractor shall maintain and update (as needed) the spacecraft manufacturer and instrument provided documentation transitioned to operations.

The Contractor shall administer and maintain any tools or software application used to support configuration management.

A.8 Training and Competency

The Contractor shall setup and maintain a comprehensive training program for all flight operations support personnel to maintain a high level of competency with the Landsat 8 flight operations team (FOT). The FOT shall be trained and certified to operate the mission. FOT training shall include:

- Functionality of the observatory (spacecraft and imaging sensor)
- Functionality of MOE software and hardware
- Operations procedures including nominal, special operations, and contingency/recovery procedures
- Operations Etiquette and protocol (voice box, log book, and CM training)

Training shall take various forms, including assignments, reading, on-the-job training, exercises to simulate typical day-in-the-life on-orbit Observatory operations, and simulator based tests. To the extent possible/practicable, the FOT shall be trained using the system(s) and interfaces that will be used in actual operations. Where this is not possible, equipment that emulates the interfaces and simulates performance with high fidelity shall be used for all testing and verification activities. The Contractor shall create and maintain a skills checklist as part of the training plan to ensure that the FOT is gaining proficiency in the appropriate areas.

The Contractor shall maintain training related documents and a training record for each FOT member as dictated by the Training Plan. Once an FOT member has completed sufficient training, the Contractor shall demonstrate competency by certification if required by the certification plan. The Contractor shall create, administer, and maintain records regarding the certification plan.

The Contractor is to develop several simulation scenarios to test critical contingencies for each observatory subsystem. The contingency scenario list will be decided between the government

and Contractor. Contingency situations are to be executed on a periodic basis by the Contractor to validate contingency procedures and FOT training.

Operator errors are to be tracked by the Contractor and presented to the government to determine weak points in the training and certification program. When an operator error is encountered the Contractor shall provide a plan to prevent the error from reoccurring.

A.9 Support of Flight Dynamics System (FDS) Functions

The Contractor shall work closely with Goddard Flight Dynamics System Services (FDSS) and USGS personnel to plan coordinate and execute all Landsat-8 spacecraft orbit and attitude maneuvers. The Contractor shall plan all maneuvers and coordinate with the multiple support elements during the execution of all maneuvers. The Contractor shall support reviews of any maneuver products with an appropriate approval process (such as CAM). After a thruster based maneuver the Contractor is to provide analysis of burn performance and track fuel consumption, tank pressure, and thruster efficiency for future maneuver planning.

The Contractor shall coordinate with the FSM to define the nominal Landsat 8 orbit with respect to the A-Train Afternoon Constellation and any deviations from the expected orbital envelope. The Contractor shall notify the FSM so he/she can notify all member satellites of the Morning Constellation of any and all instances of the Landsat 8 spacecraft transitioning into or out of Safe or Survival Mode. The Contractor will work with CARA (Conjunction Assessment Risk Analysis) and provide mission ephemerides for conjunction assessment.

The Contractor shall notify all member satellites of the Morning Constellation of any and all instances of the Landsat 8 spacecraft transitioning into or out of Safe or Survival Mode. Notification shall be in accordance with the Constellation agreement documents between the member satellites of the Morning Constellation and/or A-Train Afternoon Constellation and the ESMO Project.

The Contractor shall update maneuver and decommissioning profiles based on current spacecraft state of health as necessary.

A.10 Simulator and Flight Software (FSW) Management

The Contractor shall configure the local simulators to support special operations, contingencies, or FOT proficiency tests. The simulator configuration is to be managed so it matches the flight FSW configuration where possible, and where not possible the known differences are to be documented. The Contractor shall support testing of any FSW modifications or patches on the simulator prior to uplink to the observatory. Any noted deviations between the ground and flight FSW images are to be tracked by the Contractor.

The Contractor shall maintain documentation on how to configure the simulators and the ground system to interface with the simulators. Known simulator limitations are to be documented.

A.11 Staff Allocation, Expertise, and Level of Effort

The Contractor shall provide project management support necessary to oversee staff availability, competence, reliability, and performance of the work force required to operate the Landsat mission. Management shall be in conformance with the role of the USGS Flight Systems Manager as defined throughout this document.

Landsat 8 flight operations activities require expertise in mission planning and scheduling, on-console operations, spacecraft subsystem engineering and data analysis, development of

operations scripts and reporting. Due to the complexity of interaction between Observatory, MOC, and ground system components, the Contractor is to provide staff capable of working at a systems engineering level to ensure the functionality of the various system elements and interfaces.

The Contractor must provide capable management to oversee the flight operations team. The USGS requires one individual to be named as the Program (or) Project Manager for this effort who will ensure Contractor staff understand and can execute the scope of work required. This individual is expected to have experience with satellite flight operations as well as project management expertise. The USGS also requires one individual to be named as the Flight Operations Team Manager to support management oversight of the FOT. This individual is expected to have experience with satellite flight operations as well as flight operations management expertise. The Flight Operations Team Manager will be required to ensure that realtime, ground system, and flight segment initiatives assigned to the FOT are tasked, tracked, and executed.

The Contractor is expected to clearly define required duties and skills for each FOT position. The Contractor shall provide the proper staffing levels to plan, organize and execute operational activities with the necessary skill-mix to safely and operate the Landsat 8 mission. The Contractor shall provide a monthly staffing profile subject to approval by the USGS FSM.

After LEO and acceptance of pass automation, mission operations for most purposes should not require night shift FOT coverage. All FOT positions are expected to be present during routine business hours day shift. Mission planners and real-time operators are also expected to support one weekday swing shift and one shift per day on the weekends until deemed unnecessary w/ automation. During lights out operation real-time operators, subsystem engineers, and an FOT lead are to be on call.

A.12 Risk Management and Best Practices

The Contractor shall establish a risk management plan for flight operations risk management. This plan must be consistent with the USGS LSDS Risk Management Plan and be approved by the USGS FSM or project manager.

A.13 Organizational Interfaces, Reviews and Meetings

The Contractor shall interface with all USGS support organizations, as specified in the Operations procedures, Interface Control Documents (ICDs) and Operations Agreements (OAs). The Contractor shall interface with the USGS facility at Sioux Falls, S.D. to perform planning and scheduling functions as defined in the Landsat 8 Operations Concept and requirements documents.

The Contractor shall develop a communications plan. This plan must be approved by the USGS FSM or project manager.

Specifically, some of the interfaces include:

- Landsat Mission Management Office Telecom where status, progress, and plans are presented (currently held bi-weekly)
- Landsat Configuration Control Board (LCCB) as defined in Landsat CM processes (currently held bi-weekly)
- Landsat Operations Configuration Control Board which is to be held bi-weekly or as needed regarding observatory configuration and observatory vendor interfaces

- Landsat Flight Operations Configuration Control Board, which is to be held periodically to track MOC/bMOC configuration
- Landsat Ground System Configuration Control Board, which is to be held periodically to track the MOE hardware/software baseline
- Interface as necessary with the LDS Security team to report security scan results and security activities.
- Monthly status review (MSR) to the USGS Landsat Mission Management Office summarizing the monthly report.

The Contractor shall also support all mission related meetings to coordinate preparation activities as requested or directed by the Landsat 8 Flight Systems Manager and/or Landsat Project Management.

The Contractor shall conduct readiness reviews prior to any significant change in observatory or ground operations for FSM review/participation.

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor. At a minimum, the monthly status report shall include details concerning the following:

- Overall performance of all spacecraft subsystems, ground system and operations.
- Status and schedule of any special projects that are being worked.
- Major accomplishments section summarizing achieved vs planned accomplishments for the previous reporting period and a summary of planned accomplishments for the next reporting period
- Outstanding problems summary including progress towards solving previously identified issues and additional required actions
- New problems summary covering major problems identified during the last reporting period. The summary is to include risks, potential work-arounds/mitigations, and impacts to requirements or cost.
- List overall status of security compliance and any open discrepancies
- Risk Management Status report which covers risk mitigation actions that are being tracked and any new risk items which need to be opened.
- Action items list and status covering all open observatory critical actions, status, and plans for closing the items.
 - Milestone charts are updated
- Financial status showing subsystem and manpower resource costs
- Manpower status showing planned vs actual manpower for the reporting period

The Contractor shall provide monthly financial reports to the Task Manager and the Landsat 8 Project by using the 533M form with the necessary level of information to allow long-term budget planning. All reports shall be made available in both soft- and hardcopy media.

The Contractor shall provide a weekly status report to the USGS FSM by the close of business every Wednesday after the close of the week being reported. The report is to cover (but not limited to) pass performance, data collection stats, upcoming activities, anomaly/events/issues, and ongoing testing.

The Contractor shall also routinely meet with the FSM weekly to discuss ongoing FOT work, FOT priorities, problems, milestones and schedule.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits and coordination with the customer on specific agency requirements.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The building, Mission Operations Center (MOC), backup Mission Operations Center (bMOC), MOC Refresh Lab, and environmental control for the MOC/bMOC will be provided by the Government as will all networks, hardware and system software necessary to support flight operations activities and interfaces.

The government shall provide Contractor access to the mission operations facilities located in Building 14 and Building 32 facilities at GSFC. The maintenance of the CAPE software is provided through other contracts.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order. The Contractor shall supply cellular phones as necessary for on-call support.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order. The FOT and associated leads may travel to EROS to collaborate on mission activities.

Specifically, the Contractor shall support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
Mission Management Office TIM at Sioux Falls, SD	October 2014
MOWG (Travel to Langley, VA)	Oct 2014
MOWG (Travel to Sioux Falls, SD)	March 2015
Equipment Relocation at Orbital Sciences Corp, Pheonix AZ	July 2014
Mission Management Office TIM at Sioux Falls, SD	October 2015

MOWG (Travel to TBD)	September 2015
MOWG (Travel to TBD)	February 2016

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Document Title	Type	Due date
LDCMOPS_Status_0001	Monthly Status Reports	Report	EOM+15 days
LDCMOPS_Satus_0002	Weekly Status Report	Report	COB Wednesdays
LDCMOPS_PLN_0001	Flight Operations Configuration Management plan (refresh)	Final Plan	Jun-13
LDCMOPS_PLN_0002	Flight Operations Team (FOT) Training Plan (refresh)	Final Plan	Jun-13
TBD	FOT Certification Plan	Final Plan	June- 13
LDCMOPS_PRC_0004	Standard Operating Procedures (modifications or new)	Procedure	As needed
LDCMOPS_PRC_0005	Flight Operations Procedures (modifications or new)	Procedure	As needed
LDCMOPS_PRC_0006	Contingency Operating Procedures (modified or new)	Procedure	As needed
LDCMOPS_DOC_0001	Mission Operations Center Operations Concept (refresh)	Reference	TBD
LDCMOPS_DOC_0002	Project Reference Database System DFCD	Reference	As required
LDCMOPS_DOC_0005	LDCM Operations Handbook (refresh)	Reference	Post IOC as required
LDCMOPS_DOC_0006	MOC & FDF Mission Operations Agreement (MOA)	Reference	In FO CM
TBD	Anomaly Escalation Plan (refresh)	Reference	June- 13
TBD	Simulator Limitations	Reference	June- 13
TBD	FSW Maintenance Plan	Reference	June-13
	Refresh Operations Transition Plan		September 2014

	Annual Inventory and Inventory Reconciliation Report		February 2014
	MOC Hardware Sparing Plan		September 2014
	Hardware and Software Vendor Maintenance Plan		August 2014
	MOC Refresh Operations Readiness Review		October 2015

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: 74
Modification: 2
Task Name: Landsat 8 Ground Systems Infrastructure Support
Task Period of Performance: June 1, 2013 – May 31, 2014
Modification Period of Performance: April 1, 2014 – May 31, 2014
N/AGSMO SOW Reference: 3.7

I. Task Order History

Description of current modification (Modification 2): This is a modification to the task order statement of work for Landsat 8 Ground Systems Infrastructure Support Task.

Mod #	Start	End	Brief Description
0	6/1/2013	5/31/2014	Initial task order statement of work.
1	10/31/2013		Administrative modification.
2	4/1/2014	5/31/2014	Add training support for the MOC refresh.

II. Background

As a joint initiative between the United States Geological Survey (USGS) and National Aeronautics and Space Administration (NASA), the Landsat Project and the data it collects support government, commercial, industrial, civilian, military, and educational communities throughout the United States and worldwide. The Landsat Program provides repetitive acquisition of high resolution multispectral data of the Earth's surface on a global basis. Landsat represents the world's longest continuously acquired collection of space-based moderate-resolution land remote sensing data. Nearly four decades of imagery provides a unique resource for those who work in agriculture, geology, forestry, regional planning, education, mapping, and global change research.

The Landsat Data Continuity Mission (LDCM) is the future of Landsat satellites. The satellite launched in February, 2013. The LDCM Ground System includes all of the ground-based assets needed to operate the LDCM observatory. The primary components of the Ground System are the Mission Operations Element, Collection Activity Planning Element, Ground Network Element, and the Data Processing and Archive System.

The LDCM MOC is being developed at NASA and will transition to the USGS once declared operational, nominally about ninety days after launch. A transition plan for LDCM has been completed and is baseline.

III. Scope of Work

The contractor shall provide sustaining engineering, support for transition, network administration, systems and database administration, facility, installation, and integration support for the LDCM Ground System, focusing on the Mission Operations Center (MOC) facilities, hardware and software. The contractor shall provide:

- MOC user support
- Installations or reconfigurations
- Infrastructure support

- Facility support (environmental monitoring and other services not covered by GSFC facility engineers or contracts)
- Vendor service agreement management
- Purchasing support (supplies and materials for the MOC)
- Hardware and software inventory

A. Statement of Objectives

A.1. Facilities

The building, Mission Operations Center (MOC), backup Mission Operations Center (bMOC), and environmental control for the MOC/bMOC will be provided by the Government as will all networks, hardware and system software necessary to support flight operations activities and interfaces.

The contractor shall monitor the environment of the mission operations and equipment rooms and provide other services not covered by GSFC facility engineers or contracts.

The contractor shall perform facility implementation support for installation of power and data communications cabling and support hardware installation and basic facility modifications in the GSFC MOC facilities. The contractor is required to maintain the appropriate safety training and gear used for the lifting, installation, delivery, and relocation of heavy materials and equipment, including but not limited to servers, racks, consoles, packages, and crates.

A.2. Equipment Preventative Maintenance and Support

The contractor shall perform routine preventative maintenance and support for the MOC equipment as recommended by vendors and established standards. The contract shall implement improvements to MOC infrastructure services to improve reliability, efficiency, and IT security compliance. Personnel should be experienced with Cisco, Checkpoint, Active Directory, RSA, network management software, system and network log analysis, SNMP, proxy services and computer hardware maintenance.

The contractor shall provide support to the Landsat 8 MOC to maintain the availability and reliability of the MOC Systems, including the MOE, CAPE, LSIMSS, S/OS, and Softbench. This also includes troubleshooting problems, escalating as necessary to MOC Sustaining organizations, and tracking issues through completion and resolutions of any issues that may impact operational activities.

The Contractor shall supply the administration, configuration management and sustaining engineering for all hardware needed to support the Mission Operations Center (MOC) spacecraft operations engineering, real-time engineering, and contract staff.

The contractor shall support the Flight Systems Manager (FSM) in gathering utilization statistics for MOC hardware. The contractor shall work with the FSM or delegate to define a report structure that contains statistics such as system load averages and peak utilization periods.

A.3. Database Administration

The contractor shall maintain the Project Reference Database (PRD) Project Reference Database System (PRDS). The PRD administrator maintains database translation applications to convert the PRD to supported Commercial off the Shelf (COTS) and Government off the Shelf (GOTS) application formats. The PRD contains the Spacecraft Command and Telemetry Database, as well as the unique configuration settings for the COTS and GOTS software provided by the MOC Element Vendors. The PRDS is the repository for Configuration Managed and Development versions of the PRD, and a number of tools utilized to maintain the PRD.

A.4. Network Infrastructure Support

The contractor shall provide sustaining support of the LDCM MOC Network infrastructure and services, in order to maintain availability and reliability of services. The contractor shall manage and troubleshoot MOC infrastructure services; configure infrastructure to accommodate new features, capabilities, and requirements; provide MOC account management; interfaced with NASA Integrated Services Network (NISN) for troubleshooting and new requirements.

A.5. Information Security

The contractor shall ensure implementation of IT security standards as defined in the NASA and USGS IT security policies. The contractor shall work with the Land Satellite Data Services (LSDS) security office to ensure all project security requirements are met. The contractor shall perform necessary security scans on all equipment that is not located on the IONet (equipment on the IONet is scanned by IONet security officials as part of the USGS to NASA Interagency Operations Agreement and the IONet ISA).

All DOI systems are required to have continuous assessment and authorization (A&A). The USGS Land Satellite Data Systems (LSDS) will perform security management functions including key activities for assessment and authorization, gathering facts and ensuring the systems within the LSDS are compliant and reporting these to USGS management. As part of the Landsat Project, the Landsat Mission Operations Centers shall support this effort by providing necessary documents, information, or other security activities as required. Additionally, systems supported by the contractor may require specific controls for security, such as logon banners. The contractor shall perform necessary security scans on all equipment that is not located on the IONet (equipment on the IONet is scanned by IONet security officials as part of the USGS to NASA Interagency Operations Agreement and the IONet ISA). The contractor shall report computer security incidents to designated Landsat Project staff. Shortly following transition to the USGS, MOC systems administration and security personnel shall assist EROS Landsat Satellite Data Systems (LSDS) security personnel in preparing for the on-going A&A effort, by providing content and evidence to be incorporated in the USGS Security Standard Operating Procedures (SOPs).

A.6. Electrostatic Discharge (ESD) Protected Area (EPA)

The contractor shall provide routine monitoring and maintain the certification for the Electrostatic Discharge (ESD) Protected Area (EPA) containing the Spacecraft Simulator. Personnel should be familiar with Electrostatic Discharge (ESD) precautions for working around ESD sensitive equipment.

A.7. Vendor Service Agreements

The contractor shall manage all applicable vendor service agreements for MOC Hardware, Operating Systems, and COTS Applications, as required to meet support requirements and service levels. Management includes the procurement, tracking, and renewal. The contractor shall provide a list of all vendor warranty and maintenance including expiration dates. This may also include any recommended efficiencies for improvement of maintenance or cost savings. For example, it may be advantageous to retain-in-place certain hardware as spares rather than maintaining it. The contractor shall provide and maintain a hardware sparing plan.

A.8. Logistics, Property Management, and Configuration Management Support

The contractor shall provide administrative and technical support for the logistics, property management, and configuration management for the MOC. The contractor shall work closely with the USGS Landsat Property Manager and Landsat Project Manager to maintain the hardware inventory, process new hardware, process removal and disposition of old hardware, and the exchange of repaired components. The contractor shall work within the MIS Flight Operations Configuration Change Request; including the maintenance of supplemental material (e.g., redlines, network diagrams, detailed installation plans, and installation notes). The contractor shall maintain a media and paper documentation library for MOC Vendor and COTS software and hardware deliveries.

A.9. Office Automation Workstation Management

Office automation workstations utilized by MOC staff will be supplied by the Government and supported through NASA ACES. Workstations necessary to perform Mission Operations Center functions shall be supported by the contractor to meet NASA and USGS system standards.

A.10. Transition Support

While transition of the MOC to the USGS is being planned prior to IOC, transitions activities will remain after IOC. The contractor shall assist in support of these tasks as identified by the Flight Systems Manager. These tasks may include activities such as:

- Decommissioning of the Launch Support Room (LSR) hardware, release of LSR, and Spacecraft Analysis and Launch Support Area (SALSA) facilities
- Transition of NASA-tagged hardware to USGS property
- Transition of Flight Operations and Sustaining contracts from NASA to USGS
- Transition of Hardware Service Agreements from NASA to USGS
- Transition of Software Licenses and Service Agreements from NASA to USGS
- Optimizing of Service Agreements and Licenses, adjusting for increased sparing and cost savings
- Optimization of procedures and operations and maintenance processes to reflect smaller footprint, reduced user base, and changes to operations concepts
- Necessary infrastructure changes in the bMOC

A.11. MOC Refresh

The contractor shall support the design and implementation of the MOC Refresh. The MOC Refresh effort is for the replacement, modernization, and virtualization of the LDCM MOC and bMOC systems. The contractor shall provide for any technical training required for the Operations and Maintenance for the Refresh.

B. Management Reporting

The contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the work breakdown structure to adequately describe the activities and status of the task to the Task Monitor.

The contractor shall provide a monthly status report to the FSM that provides a summary of the activities and overall status of the MOC infrastructure. At a minimum, this report shall

- Provide a systems utilization summary for all MOC systems
- List overall status of security compliance and any open discrepancies
- Status of any special projects including system reconfigurations or installations
- Provide a risk management status for infrastructure
- Schedule including action item status and plans for closing actions
- Financial status including burn rate

The contractor shall provide a weekly status report to the FSM by the close of business every Wednesday. This report should provide a listing of activities completed, a status of activities being worked, plans for the upcoming week, and any anomalies, events or issues.

C. Contractor Controlled Property

The contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The building, Mission Operations Center (MOC), backup Mission Operations Center (bMOC), and environmental control for the MOC/bMOC will be provided by the Government as will all networks, hardware and system software necessary to support flight operations activities and interfaces.

V. Material Procurement

The Contractor shall procure materials that are identified as necessary to perform the work associated with this Task Order. The Task Monitor shall concur with the materials list prior to procurement for any changes.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Operational Systems Optimization Plan	9/2013
2	Systems Quarterly Load Average Report (report monthly system load averages for the quarter)	Quarterly starting 9/2013
3	Annual Inventory and Inventory Reconciliation Report	9/2013
4	MOC Hardware Sparing Plan	9/2013
5	Equipment and Software Vendor Maintenance Plan	9/2013
6	Weekly Status Report	COB Wednesdays
7	Monthly Status Report	EOM + 15 days

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: 75
Modification: 3
Task Name: Fermi Mission Operations Support
Task Period of Performance: August 1, 2013 – September 30, 2015
Modification Period of Performance: October 1, 2014 – September 30, 2015
GSMO SOW Reference: Section 3

I. Task Order History

Description of current modification (Modification 3): This is an extension for Fermi mission operations support under the GSMO contract.

Mod #	Start	End	Brief Description
0	8/1/2013	7/31/2014	Initial task order statement of work.
1	2/4/2014		Administrative modification
2	8/1/2014	9/30/2014	No cost extension
3	10/1/2014	9/30/2014	Extension of task

II. Background

Launched in June, 2008, the Fermi Gamma-ray Space Telescope (FGST) mission completes its five year prime mission phase in August 2013 and enters a planned 5 year extended mission phase.

This task order authorizes the contractor to provide mission operations and engineering support to the Space Science Mission Operations (SSMO) Project for the FGST mission, which includes all FGST space and ground segment assets under direct control of the SSMO project and the scheduling of assets controlled by Goddard Space Flight Center (GSFC) Code 450 (SN and USN resources). FGST Mission Operations will be performed at the FGST Mission Operations Center (MOC) in Building 14 at GSFC. A back-up mission operations center is located in Building 32 at GSFC. The assigned Contractor will interface with the SSMO Project, the FGST Project Science Team, the FGST Science Support Center (FSSC), Flight Dynamics Facility (FDF), GSFC Code 450, and each of the individual Instrument Science Operations Centers (ISOCs). The task is to be split into the following sub-tasks:

- Sub-task 1: Mission Operations
- Sub-task 2: Virtual Machine (VM) Configuration
- Sub-task 3: Fermi Realtime SGSS Configuration

III. Scope of Work

The Contractor shall provide all operations and engineering support required to perform FGST mission operations, data processing and analysis, anomaly identification and resolution, and delivery of science and engineering data products to the Instrument Science Operations Centers (ISOCs).

A. Requirements**Sub-task 1: Mission Operations**

- A.1. The Contractor shall plan and execute daily operations as per the FGST Flight Operations Plan
- A.2. The Contractor shall operate and maintain the health and safety of the FGST
- A.3. The Contractor shall schedule forward and return services to support the science timeline

- A.4. The Contractor shall participate in science planning activities
- A.5. The Contractor shall perform required spacecraft trajectory or orbit and attitude planning and determination
- A.6. The Contractor shall perform pre-pass and post-pass activities as required
- A.7. The Contractor shall forward burst alert telemetry to the Burst Alert Processor (BAP) Requirement: 7 seconds)
- A.8. The Contractor shall forward LAT housekeeping data to the LAT Instrument Operations Center (IOC)
- A.9. The Contractor shall recover science data (Requirement: 98% data recovery) and generate Pass Oriented Level Zero (POLO) products in the MOC
- A.10. The Contractor shall deliver POLO products and ancillary files to the Fermi Science Support Center (FSSC) at GSFC and the LAT IOC and the GBM IOC (Requirement: 72 hour latency from time data taken on board)
- A.11. The Contractor shall provide remote access to view archived housekeeping data via the secure MOC web site
- A.12. The Contractor shall collect and store housekeeping and health and safety data
- A.13. The Contractor shall process, trend, and analyze housekeeping and health and safety data on a short-term, long-term, and periodic basis
- A.14. The Contractor shall present trend data at the weekly status meeting
- A.15. The Contractor shall identify, analyze, resolve, and track anomalies
- A.16. The Contractor shall execute pre-approved procedures for known anomalies
- A.17. The Contractor shall work with the Mission Director, the Project Scientist, the system engineers, and other team members to develop and test a response to new anomalies
- A.18. The Contractor shall document mission level anomalies in SOARS
- A.19. The Contractor shall provide a Root Cause & Corrective Analysis (RCCA) all operator induced anomalies
- A.20. The Contractor shall plan, rehearse, simulate, perform and assess in realtime any special or contingency operations
- A.21. The Contractor shall monitor for potential collisions with other spacecraft and space debris
- A.22. The Contractor shall follow the established timeline of activities in the case of potential collision avoidance maneuver (CAM)
- A.23. The Contractor shall operate and maintain the necessary facilities, materials, ground support equipment, and other items required to support the Fermi mission
- A.24. The Contractor shall maintain the MOC/b-MOC, located in Building 14 and 32 respectively at GSFC
- A.25. The Contractor shall conduct operations from the b-MOC, exercising the full functionality of the b-MOC semi-annually
- A.26. The Contractor shall schedule and execute a minimum of 1 pass with each USN station quarterly
- A.27. The Contractor shall support ground system interface testing as necessary
- A.28. The Contractor shall maintain a list of all hardware that resides in the MOC/bMOC
- A.29. The Contractor shall manage all hardware and shall support the SSMO logging of hardware in N-PROP
- A.30. The Contractor will provide an updated hardware list annually
- A.31. The Contractor shall participate in Configuration Control Boards as appropriate
- A.32. The Contractor shall maintain and adhere to all documentation including Interface Control Documents (ICDs), Project Service Level Agreement (PSLAs), Configuration Management Plan, Flight Operations Procedures, red/yellow limit checks, RTS trip responses, etc
- A.33. The Contractor shall maintain Configuration Management over all operations products including the T&C Database, Display Page Definitions, STOL Procedures, Flight Ops Procedures FOPs, and baseline configuration files for the MOC subsystems
- A.34. The Contractor shall manage all configuration changes via the Mission Operations Change Request (MOCR) system
- A.35. The Contractor shall provide system administration support for all systems within the MOC/bMOC

- A.36. The Contractor shall comply with all GSFC/SSMO IT Security, system level scanning, and patching requirements
- A.37. The Contractor shall provide a Flight Operations Team (FOT) that is able to support a 8 x 5 nominal shift but also support lights-out operation 24 x 7
- A.38. The Contractor shall provide appropriate classroom and on-the-job training for all new FOT members
- A.39. The Contractor shall provide a FOT certification process and shall ensure that all FOT members are cross certified
- A.40. The Contractor shall provide a FOT re-certification process and shall ensure that all FOT members are re-certified every 5 years
- A.41. The Contractor shall update and maintain FOT training and certification material as needed
- A.42. The Contractor shall provide sustaining engineering for the MOC/b-MOC
- A.43. The Contractor shall maintain a lab for software modification/testing
- A.44. The Contractor shall follow appropriate configuration management processes for the delivery and installation of any software modifications
- A.45. The Contractor shall support the Fermi Flight Software Configuration Control Board (CCB), GSFC Code 582, and provide CCR technical review and impact assessments as needed
- A.46. The Contractor shall implement/deliver Phase 2 FDS software enhancements.
- A.47. The Contractor shall respond to further modification needs due to the SGSS planned modifications
- A.48. The Contractor shall support SSMO initiatives including Data Archive Tool (DAT), Dashboard, and Configuration Management Audit/Alignment

Sub-task 2: Virtual Machine (VM) Configuration

- A.49. The Contractor shall support the integration, testing, and transition of/to the new VM configuration

Sub-task 3: Fermi Realtime SGSS Configuration

- A.50. The Contractor shall develop MOC/b-MOC requirements for the proposed 40 Mbps Fermi realtime SN/SGSS

B. Management Reporting

The Contractor shall provide a weekly ops status report, presented at the weekly ops status meeting; a quarterly ops status report, presented at the Quarterly review; the monthly 533 financial report to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

A. Office Space

All FOT personnel supporting this task order shall utilize government-furnished office space. This shall include office furnishings, telephone, desktop computer hardware and software resources used under the previous contract, and internet access.

Sustaining engineering and system admin personnel supporting this task order shall utilize off-site office space provided by the contractor.

B. MOC Computer Systems and Peripherals

The GSMO contractor shall provide property management of all computer systems that comprise the MOC/b-MOC subsystems and associated peripheral equipment.

C. MOC Software

The GSMO contractor shall maintain all software associated with the computer systems that comprise the MOC/b-MOC subsystems under this task order.

D. MOC License Agreements

The GSMO contractor shall renew all license agreements associated with the computer systems that comprise the MOC/b-MOC subsystems under this task order.

V. Material Procurement

The Contractor shall propose material, including license agreements, that they identify as necessary to perform the work associated with this Task Order. All IT purchases, not on the approved list, must be approved prior to purchase.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

Specifically, the contractor shall support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
None	

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Weekly Fermi Operations Status Report	Weekly on Wednesday
2	Quarterly Fermi Operations Status Report	Quarterly
3	Monthly 533 Financial Report	Monthly
4	Escalation Plan describing pre-approved anomaly responses, S/C Subsystem Engineer Points-of-Contact, and management calling tree	Updates as necessary
5	Summary of Configuration Baseline	Updated quarterly
6	S/C Subsystem Trending Report summarizing key telemetry	Compiled weekly and

	for all major S/C subsystems and instruments, and identifying instances of limit violations and out-of-specification performance	quarterly
7	Anomaly Closeout Reports including root cause analysis of incidents, anomaly resolution, corrective actions/lessons learned, interim workarounds, and final resolution	By the 10 th business day following the resolution of Level I Anomaly
8	MOCRs	As needed
9	SOARS	As needed
10	FOT Certification/re-certification records	As needed/bi-annually
11	Updated HW and SW inventory	Annually
12	Plan/schedule for update/review of ops procedures, limit checks, and RTS trip responses	Task award + 60 days
13	Updated CM Plan	Task award + 120 days

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: 76
Modification: 4
Task Name: OSIRIS-REx Ground and Mission Operations Support
Task Period of Performance: 6/01/13 to 5/31/15
Modification Period of Performance: 6/01/15 to 5/31/16
GSMO SOW Reference: 2.1, 2.4

I. Task Order History

Description of current modification (Modification 4): This modification extends the overall support for the OSIRIS-REx Ground and Mission Operations Support task.

Mod #	Start	End	Brief Description
0	6/01/13	5/31/2014	Initial task order statement of work.
1	9/01/13	5/31/2014	Provide mission critical travel support for science meetings and lessons learned at various locations.
2	6/01/14	1/31/2015	Extend period of performance for additional year.
3	1/01/15	5/31/15	Add effort and travel plus extend the period of performance
4	6/01/15	5/31/16	Add requirements and extend the period of performance

II. Background

The purpose of this task is to support the OSIRIS-REx Ground System & Mission Operations Manager. This work includes, but is not limited to, the technical and management activities described in this SOW.

III. Scope of Work

The Contractor shall support the OSIRIS-REx Ground System & Mission Operations Manager and the Mission Systems Engineer. Specific requirements are provided in section A.

A. Requirements

Subtask 001

1. Perform Systems Engineering duties.

Effort includes:

- Support preparations for the Ground Mission Operations Review (MOR) (June 2015).
- Participate in Ground System and Element peer reviews leading to the Ground MOR.
- Support the continued development for operation cadences and incorporate human factors
- Support the phase exit criteria evaluation to better defined objective measurable criteria
- Support the development of the various contingency plans
- Lead the effort to update the Phase E master schedule
- Assist in the closures of the Ground Request for Actions (RFAs) and Advisories from the Cadence EPR and Ground CDR reviews. Provide timely and direct closure information on assigned RFAs and Advisories
- Support lessons learned efforts by meeting with similar missions, to include international travel to Europe and Canada

- Provide [redacted] and support for the implementation of the Ground System architecture to include processes, tools, hardware, software, networks, and procedures.
- Provide [redacted] the implementation of the Ground System test program .
- Ensure proper software lifecycle criteria and milestones are achieved prior to the GRTs by reviewing acceptance test plans, procedures and supporting readiness reviews and event out briefs (Ensure requirements are properly linked and verifiable prior to each test)
- Risk Management: Identify risks, provide inputs using the O-REx Risk Management tool, and support the O-REx Project Risk Board.
- [redacted]
- [redacted]
- [redacted] Tiger Teams as requested.
-

Provide support to standing meetings as follows:

- Weekly Ground WG
- MSA/SPOC/FDS Interface
- GNC/FDS weekly meeting
- GRT weekly working group meetings
- SVT meetings
- Various LM Spacecraft Design Meetings
- Systems Engineering WG
- Payload WG
- V&V WG
- Project CCB as needed
- Monthly Management Reviews
- Monthly Project Risk Management meetings
- Project Tag-up Meeting
- Ground and project TIMS (science working group)

Subtask 002

2. [redacted] Ground Test program

Effort includes:

- [redacted] Ground Test Program
- Release the final of the Ground Verification, Validation, and Test Plan
- Establish and chair the GRT working group and meetings
- Prepare for and conduct Ground Readiness Test 3 & 4.
- Initiate activities for Launch Operation Readiness Test
- Participate in the development of ATLO's System Verification Tests to ensure ground requirements are validated
- Develop the details and schedule for the Operational Readiness Tests (ORT)
 - To be documented in an ORT plan
- Maintain the Ground Test List and develop/maintain the Test Schedule. Provide as inputs to the Integrated Master Schedule.
- Prepare for Phase E test.
- Recommend updates to Ground System requirements as necessary based on Ground Test Program.
- Review and support Project verification effort on closeout of Ground related Level 2 requirements.
- Initiate and process CCRs against the MRD as needed.
- Assist and coordinate MSA, SPOC and FDS in preparing for the GRT 5 "End to End".

Subtask 003

3. IT Security

- Provide support as the Information Systems Security Officer (ISSO)
- Lead the Project's efforts in obtaining Authorizations to Operate/Proceed (ATO/ATP) for the Ground elements
 - This includes JPL assets (MSA, DSN, MGSS), the Science Processing and Operations Center (SPOC), the Flight Dynamics element
- Establish a Continuous Monitoring Plan
- Establish, initiate, and support monthly risk management reporting to the Information Systems Official.
- ~~_____~~
- Chair the IT Security Working Group. Develop agendas, facilitate meetings/teleconferences, and distribute minutes and actions.
- Respond to NASA IT Security related actions.
- Track Plans of Actions & Milestones (POAMs)
- Prepare for a Project self-assessment of the Simi Valley KinetX facility. This includes reviewing artifacts, developing assessment checklist and schedule, conducting the assessment and documenting and briefing findings and recommendations.
- Prepare for a Project self-assessment of the MSA. This includes reviewing artifacts, developing assessment checklist and schedule, conducting the assessment and documenting and briefing findings and recommendations.
- Obtain IT security approval to fly mission (ATP)

4. Travel

Provide mission critical travel support for science meetings and lessons learned at various locations including both domestic and international travel.

The execution of these activities will require travel to the different sub-systems located at: Tucson, AZ; GSFC; Lockheed Martin in Littleton, CO., and Simi Valley, CA. Additionally, travel is required to support mission critical science meetings (at various locations), Lessons Learned (ESA, JPL), and conferences (Big Sky, Space ops) including international travel to Toronto, Canada and Europe

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

There are no Government furnished facilities, equipment, or software associated with this Task Order.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

{End of SOW}

GSMO TASK ORDER

Task No: **79**
 Modification: **5**
 Task Name: **DSCOVER GS MOC Element Networks**
 Task Period of Performance: **8/19/2013 to 6/30/2015**
 Modification Period of Performance: **3/23/2015 - 9/30/2015**
 GSMO SOW Reference: **2.3.1, 2.3.2.11, 2.4**

I. Task Order History

Description of current modification (Modification 0): Initial task order statement of work for DSCOVER GS MOC Element Networks.

Mod #	Start	End	Brief Description
0	08/19/2013	7/31/2014	Initial task order statement of work.
1	08/19/2013	8/31/2014	Task Extension to provision FCDAS, Support GRT and ETE Testing, and travel to Fairbanks, AK
2	9/1/2014	4/30/2015	Task extension adding scope for Network Sustainment support through Launch and Early Operations.
3	1/28/2015		Administrative Change
4	3/23/2015	6/30/2015	IT security requirements compliance as described below is required through June 2015
5	5/1/2015	9/30/2015	Task extension through Sept 2015 for MOC IT Security Release 4.1

II. Background

DSCOVER is an operational mission that collects space weather data for the National Oceanic and Atmospheric Administration (NOAA) while stationed in a Lissajous orbit about the first Sun Earth Libration point. The mission will serve as the primary replacement for the National Aeronautics and Space Administration (NASA) / Goddard Space Flight Center (GSFC) Advanced Composition Explorer (ACE) mission that provides early warning of geomagnetic storm activity that may affect Earth-orbiting spacecraft and Earth-based systems such as the power grids. The Observatory will also collect images and radiometric data on a best effort basis. The Mission Operations Center (MOC) will be located at NOAA Satellite Operations Facility (NSOF) with a backup MOC at Wallops Command and Data Acquisition Station (WCDAS). The DSCOVER project worked with NSOF engineers to develop a network design that meets the NOAA and industry standards, requirements and policies. This SOW provides the engineering,

development and installation services needed to implement the network and security aspects of the design in the NSOF building in Suitland MD. The network and security equipment will interface to the MOC ground segment equipment provided by Omitron and NISN.

III. Scope of Work

A. Requirements

The contractor shall provide network management and engineering expertise for the installation, setup, configuration, deployment and testing of the DSCOVER MOCE, bMOC, and CDAS networks and security equipment.

The Network Architecture shall meet or exceed the DSCOVER network requirements defined in the GS Level 3 requirements.

The contractor will coordinate with DSCOVER project manager and DSCOVER ground segment implementation contractor, OMITRON, to determine receivables and deliverables for the test and deployment of the network equipment at the contractor facilities. The contractor will coordinate with NSOF for deployment of network equipment in the NSOF facility. The Contractor will coordinate with NASA/Wallops for deployment of network equipment in the Wallops facility for the bMOC and CDAS. The contractor will support the IATT and ATO at the NSOF and Wallops facilities and provide the documentation necessary for the accreditation. The contractor will receive, inspect, and inventory all network and security hardware. The contractor will also maintain the manufacturer warranty on all network and security hardware. The contractor will unpack, power-up, configure, integrate, and install all delivered modules; hardware add-ins and performance test all hardware.

If needed, the contractor will configure network equipment inside network and security hardware at the NASA facility to perform testing with the servers and workstations. The contractor will transport all network and security hardware to NSOF (Release 1) and stand-up all systems in the data center. The contractor will configure all network and security hardware to NOAA and industry standards, requirements and policies. The contractor is not responsible for the cabling between the facilities and the hardware both external and internal. The contractor will however, connect into all external and internal systems as per the network and security architecture design. The contractor will test the connection to the GSFC IONet and other links into the DSCOVER network boundary. The

contractor will conduct end-to-end testing of the entire DSCOVER MOC network and security systems to support the A&A and ATO authorization.
(MOD 1) The contractor shall provide network support for Ground Readiness testing and End-to-End Testing.

(MOD 1) The contractor shall provision the FCDAS Ground Station for network connectivity to the NSOF MOC and Wallops Backup-MOC via NOAA provided dedicated T-1 Lines.

(MOD 1) The contractor shall provision FCDAS for N-Wave connectivity, to the maximum extents possible.

(MOD 2) The contractor shall provide IT Security and Network Engineering expertise for the sustainment of the DSCOVER MOC and bMOC and associated connections.

(MOD 2) IT Security

(MOD 2) The contractor shall support NIST 800-53 Rev C compliance, remediation and demonstration of the DSCOVER Networks and any associated Plans of Action & Milestones (POA&Ms).

(MOD 2) The contractor shall support NIST 800-53 Rev C compliance, remediation, and demonstration of the DSCOVER MOC Systems

(MOD 2) The contractor shall support NASA and NOAA's preparation for Authority To Operate (ATO). The contractor shall provide system analysis and remediation support as related to the ATO preparations.

(MOD 2) The contractor shall support quarterly vulnerability and penetration security testing and reporting until handover to NSOF.

(MOD 2) The contractor shall interface with NASA and NOAA IT security for the completion and execution of Interconnect Security Agreements.

(MOD 2) The contractor shall interface with NASA and NOAA IT security for the completion, remediation, and execution of the Geostationary Operational Environmental Satellites (GOES) N, O, P, Missions System Security Plan.

(MOD 2) The contractor shall support the demonstration of compliance to the NASA / GSFC Code 400 Moderate System Security Plan and NASA systems that fall under it.

(MOD 2) Networks

(MOD 2) The contractor shall provide support for the MOC and bMOC Network configuration, performance, tuning, and administration.

(MOD 2) The contractor shall support the DSCOVER Local Area Network (LAN) warranty service including patching, troubleshooting, and part replacement.

(MOD 2) The contractor shall support equipment at the following sites: FCDAS, WCDAS, and NSOF for the per-release hardware configuration, deployment, configuration, testing, IT security scanning, and any post deployment testing or troubleshooting.

(MOD 2) The contractor shall support MOC / bMOC Release testing, Ground Readiness Testing, End to End tests, Mission Rehearsals, and Mission Simulations in the prelaunch time frame. Support for these events includes pre-test check out, on-site physical presence, and on-call support.

(MOD 2) The contractor shall support and maintain the Network Configuration Manual and analyze security log data collected.

(MOD 2) The contractor shall support on-site NOAA arranged penetration testing, scanning, and benchmarking as required in preparation for ATO.

(MOD 2) The contractor shall support conducting NESSUS site scanning and CIS Level 2 benchmarks for all DSCOVER Networking equipment.

(MOD 2) The contractor shall support engineering analysis and impact assessment of Test Discrepancy Reports and Configuration Change Requests as assigned.

(MOD 2) The contractor shall provide around the clock support for the day of launch and the 1st 48hrs.

(MOD 2) The contractor shall support the preparations and planning network transition to NOAA.

(MOD 5) MOC Release 4.1

(MOD 5) The contractor shall implement IT Security Requirements listed in Appendix 1.0 MOC Release 4.1 IT Security Requirements.

(MOD 5) The contractor shall derive and propose a set of deliverables associated with Appendix 1.0. A Review and Final version of deliverables, not related to CIS or NESSUS, shall be delivered to the Government no less than 30 calendar days apart.

(MOD 5) The contractor shall support a Single Design Review presenting the implementation approach and, if applicable, system design changes, plans for testing etc, corresponding to requirements listed in Appendix 1.0 MOC Release 4.1 IT Security Requirements. (See section VII Deliverables).

(MOD 5) The contractor shall support the Operations Transition Review (OTR), where NASA presents, to a NASA/NOAA review board, ground system performance and spacecraft commissioning results to demonstrate the Observatory and ground system performance are ready for handover to NOAA. (See section VII Deliverables below).

(MOD 5) The contractor shall support the Operations Acceptance Review (OAR) where, where NOAA presents to a NASA/NOAA review board readiness for DSCOVER normal operations. This review is scheduled for July 15, 2015.

(MOD 5) The contractor shall support the MOC Release 4.1 Operations Transition Review (OTR) where the contractor will demonstrate the readiness of Networks to support operations. (See section VII Deliverables).

(MOD 5) The contractor shall deliver all passwords and related essential information for successful operations and maintenance of all DSCOVER Network equipment located at the NSOF MOC, Wallops bMOC, FCDAS, and WCDAS. (See section VII Deliverables).

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

There are no Government furnished facilities, equipment, or software associated with this Task Order.

(MOD 1) The Government will provide dedicated T-1 lines between FCDAS and NSOF MOC and between FCDAS and Wallops bMOC.

(MOD 1) The Government will provide N-Wave for connectivity between FCDAS and SWPC.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

NSOF, Suitland MD Completed)

Installation Activities - daily 50 days

Wallops Island, VA (Completed)

Site visit- 3 Days

Engineering Technical Interface Meetings – 2 trips (Jan 2014 and April 2014), 3 days each, Jan 2014 and April 2014 Completed)

Installation and Checkout- 25 days 5/2014

MOD 1: Travel to Fairbanks, Alaska 7/2014 (Completed)

Fairbanks Installation and Check Out: 6 days

MOD 2: Travel to KSC, FL

NISN Network connections assessment: 5 days (1-person) 1 Trip

MOD 2: Travel to Fairbanks, Alaska 9/22/2014

Fairbanks CDAS and N-Wave connections: 5 days (1-person) 1 Trip

MOD 2: Wallops Island, VA

Network Sustainment: 4 Days (1-person), 4 Trips

MOD 4 Wallops Island, VA

Network Sustainment: 4 Days (1-person), 5 Trips

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Configure Edge Network Equipment (COMPLETE)	10/2013
2	Site acceptance delivery of Release 1 (NSOF) COMPLETE	2/2014
3	Site Acceptance testing and deliver of Release 2 (NSOF) (COMPLETE)	5/2014
4	Configure bMOC hardware (WCDAS) (Complete)	6/2014
5	Configure Fairbanks CDAS Network Hardware	7/21/2014
6	ISA	10/31/14
7	Network Configuration Manual	7/4/2014 Draft 8/22/2014 Final
8	Network Configuration Manual	12/31/2014 Update
9	Networks MOC Release 4.1 Single Design Review	May 29, 2015
10	Operations Transition Review (OTR)	June 26, 2015
11	Networks MOC Release 4.1 Transition Review	Sept 18, 2015
12	Networks MOC Release 4.1 Operational	Sept 18, 2015
13	Network Equipment Passwords	Aug 30, 2015

VIII. Acronyms

bMOC	Backup Mission Operations Center
DSCOVr	Deep Space Climate Observatory
FCDAS	Fairbanks Command and Data Acquisition Site
GS	Ground Segment
ISA	Inter-Connection Security Agreement
MOC	Mission Operations Center

NISN	Integrated Network Services
NPROP	NASA Property Inventory system
NSOF	NOAA Satellite Operations Facility
N-Wave	NOAA's Science Network
SWPC	Space Weather Prediction Center
WCDAS	Wallops Command and Data Acquisition Site

Appendix 1.0 MOC Release 4.1 IT Security Requirements

	Interpreted NASA SOW Items (Requirements on DSCOVr team)
4.1.1	<u>The contractor shall</u> perform vulnerability scanning following the delivery of MOC release 4.1.
4.1.2	<u>The contractor shall</u> provide NESSUS scan results no later than 10 days after delivery of Release 4.1.
4.1.3	<u>The contractor shall</u> complete required vulnerability assessment scanning and reporting activities across all IT interfaces in the hardware inventory.
4.1.4	<u>The contractor shall</u> complete authenticated scans of at least 95% of the active IP interfaces in the component inventory, with a goal of 100% of all active interfaces that support authenticated scans.
4.1.5	<u>The contractor shall</u> use the NESSUS vulnerability-scanning tool.
4.1.6	<u>The contractor shall</u> provide scan results to NOAA in native NESSUS format, XML format, and CSV format.
4.1.7	<u>The contractor shall</u> provide the scanner policy and the hardware inventory, as of the scan date.
4.1.8	<u>The contractor shall</u> update Nessus software and associated vulnerability plugins prior to all scanning activities.
4.1.9	<u>The contractor shall</u> maintain an updated hardware inventory that indicates if a device cannot be scanned with successful authentication using the NESSUS tool.
4.1.10	<u>The contractor shall</u> provide an explanation of the issues preventing successful authenticated scanning.
4.2.1	<u>The contractor shall</u> patch all system components for confirmed critical and high vulnerabilities in MOC Release 4.1 with commercially-available and government off-the-shelf mitigation solutions based on updated scans along with the condition if a patch "breaks" the system in testing, a joint NOAA/NASA team will need to assess the risk and either fix the problem or document the rationale for the NOAA System Owner to request that the NOAA Authorizing Officials accept the risk.
4.2.2	<u>The contractor shall</u> establish a baseline for Release-4.1 using the Release-4 post-implementation scan results.

	Interpreted NASA SOW Items (Requirements on DSCOVER team)
4.2.3	The contractor shall document the extent to which the OSPO DSCOVER Hardening Checklist security settings are implemented, including anti-virus configurations and component level local security policy settings, noting exceptions to the DSCOVER Hardening Checklist settings where necessary to meet the component's Least Functionality configuration.
4.2.4	The contractor shall test software updates related to flaw remediation for effectiveness and potential side effects on all affected DSCOVER components before installation within the operations environment.
4.2.5	The contractor shall maintain a roll-back configuration image in the event of patch deployment failure.
4.2.6	The contractor shall include provisions for use of the Backup MOC (bMOC) to support testing.
4.2.7	The contractor shall provide documentation containing reasons (such as due to age, mission, or technical impact) for components that cannot be patched.
4.3.1	The contractor shall update and maintain the McAfee anti-virus software virus definition files for all system components that can support this capability, using the NOAA-furnished licenses.
4.3.2	The contractor shall update and maintain the McAfee anti-virus software virus definition files weekly.
4.3.3	The contractor shall update and maintain the McAfee anti-virus software engine for all system components that can support this capability, using the NOAA-furnished licenses for the NOAA.
4.3.4	The contractor shall update the McAfee anti-virus software engine prior to release 4.1.
4.3.5	The contractor shall identify and document specific components that are unable to be scanned by McAfee anti-virus software.
4.3.6	The contractor shall implement compensating security controls, in consultation with the NOAA DSCOVER ISSO, for components that are unable to be scanned by McAfee anti-virus software.
4.3.7	The contractor shall provide an analysis report listing each component that cannot support antivirus and malware protection software and supporting rationale.
4.4.1	The contractor shall provide documentation itemizing all ports, protocols, and services necessary for system functionality.
4.4.2	The contractor shall establish firewall rules and access control lists to restrict ports, protocols, and services to only those documented as necessary for system functionality.
4.4.3	In cases where a port, protocol, or service is prohibited by the baseline in the OSPO DSCOVER Hardening Checklist, or is associated with known vulnerabilities, e.g. telnet, the contractor shall submit an analysis report to NOAA listing each port, protocol, and service that cannot be prohibited and supporting rationale

	Interpreted NASA SOW Items (Requirements on DSCOVER team)
4.4.4	The contractor shall implement the secure configuration settings in accordance with the OSPO DSCOVER Hardening Checklist, with exceptions for settings where necessary to meet the component's least functionality configuration.
4.4.5	If a software application is not listed in the DSCOVER Hardening Checklist, the contractor shall implement applicable CIS Level 1 baseline configuration settings benchmarks within the National Checklist Program, with exceptions for settings where necessary to meet the component's least functionality configuration.
4.4.6	If a software application is not listed in the DSCOVER Hardening Checklist, the contractor shall implement the DISA STIG baselines within the National Checklist Program wherever CIS level 1 benchmarks do not exist, with exceptions for settings where necessary to meet the component's least functionality configuration.
4.4.7	If a software application is not listed in the DSCOVER Hardening Checklist and no National Checklist Program benchmark exists for the software, the contractor shall implement vendor or industry best practice hardening settings, with exceptions for settings where necessary to meet the component's least functionality configuration.
4.4.8	The contractor shall provide an up-to-date hardware inventory of DSCOVER system components providing the following information for all devices within the DSCOVER subsystem boundary: Property Barcode; Hostname; Component Type; Manufacturer; Model; Service/Serial Number; Operating System; Component Revision/version; Site; Room; Rack; IP Address (of all IP interfaces associated with the host); MAC Address; Date of Last Scan; Authenticated Scan (Yes/No).
4.4.9	The contractor shall provide inventory updates whenever the system configuration changes.
4.4.10	The contractor shall provide an inventory listing compliant with <i>NESDIS IT SYSTEMS COMPONENT INVENTORY MANAGEMENT POLICY AND PROCEDURES</i> , v1.2, Sept 1, 2011, of COTS, GOTS, and other software and licenses, with all applicable licensing and warranty information including but not limited to: Release 4.1 software configuration; Software Name; Version Number; Configuration Information; License ID Number; License Expiration Date; Status of Renewal; License Type (e.g., individual, shared, site, etc.); License Holder; Method of License Enforcement; Hostname/Location.
4.4.11	The contractor shall provide documentation that includes Release 4.1 configurations in descriptions, visual images and tables to the extent that any person who has reasonable software, system administration, or network administration experience could reproduce the Release 4.1 systems from bare hardware, OS, application scripts, source code and settings without prior knowledge of the system.

	Interpreted NASA SOW Items (Requirements on DSCOVER team)
4.4.12	The contractor shall provide documentation that includes CM record of any changes to the Release 4.1 configurations which include the issue, resolution, system(s) affected, code module affected including OS packages/configuration, implementation, verification / test results, and authorizing signatures.
4.4.13	The contractor shall provide documentation that includes detailed system architecture diagrams depicting all operational devices and their interconnections, including workstations, servers, network and security devices, and all other devices required for system functionality for both physical (OSI Layer 1) and logical (OSI Layer 2/3) interconnections. Diagram output format shall be in its original format.
4.4.14	The contractor shall provide detailed system architecture Diagrams in their original, editable, format.
4.5.1	The contractor shall monitor system and network security for intrusions detection and notify the NOAA ISSO immediately of any findings.
4.5.2	The contractor shall provide audit logs for all DSCOVER perimeter devices at all locations, including all firewalls, load balancers
4.5.3	The contractor shall collect audit logs weekly.
4.5.4	The contractor shall provide audit logs in CSV format and XML format, if available.
4.5.5	The contractor shall provide audit logs to the NOAA DSCOVER ISSO weekly.

End of Task Order Statement of Work